BIOTHERM ENERGY

Proposed Construction of the Aletta 140MW Wind Energy Facility near Copperton, Northern Cape Province

Final Scoping Report

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Signature:	
For:	SiVEST Environmental Division

KEY PROJECT INFORMATION

FARM DESCRIPTION	21 DIGIT SURVEYOR GENERAL CODE
Portion 1 of Drielings Pan No.101	C06000000000010100001
Portion 2 of Drielings Pan No.101	C06000000000010100002
Portion 3 of Drielings Pan No.101	C06000000000010100003
Remainder of Drielings Pan No.101	C06000000000010100000

ALETTA WIND: APPLICATION SITE & DEVELOPMENT AREA		
CORNER POINT COORDINATES		
POINT	**SOUTH**	**EAST**
A_01 (NW)	S29° 52' 51.794"	E22° 32' 27.848"
A_02 (NE)	S29° 59' 52.858"	E22° 35' 30.970"
A_03 (SE)	S30° 2' 11.890"	E22° 33' 19.076"
A_04 (SW)	S29° 56' 56.872"	E22° 27' 9.065"

Refer to Appendix 8A for the full list of coordinates.

TITLE DEEDS: These are included in Appendix 8B.

PHOTOGRAPHS OF SITE:

General Characteristics of the study area

TYPE OF TECHNOLOGY: Wind Turbines

STRUCTURE HEIGHT: Max hub height of 120m, and rotor diameter of 150m.

SURFACE AREA TO BE COVERED: The total area of the application site is 11 002 hectares. The area occupied by each wind turbine will be up to 0.5 hectares (85m x 60m). A hard standing area / platform of approximately 2 400m^2 (60m x 40m) per turbine will be required for turbine crane usage. The temporary lay-down / staging area will be approximately 40 00m^2. The operations building will have a total combined footprint that will not exceed 300m^2. The final design details are yet to be confirmed. These details will become available during the detailed design phase of the project, after the project has been selected as a Preferred Bidder project under the Department of Energy's (DoE) Renewable Energy Independent Power Producers Procurement Programme (REIPPPP)

TURBINE DESIGN: The final design is not available but average specifications are presented below:

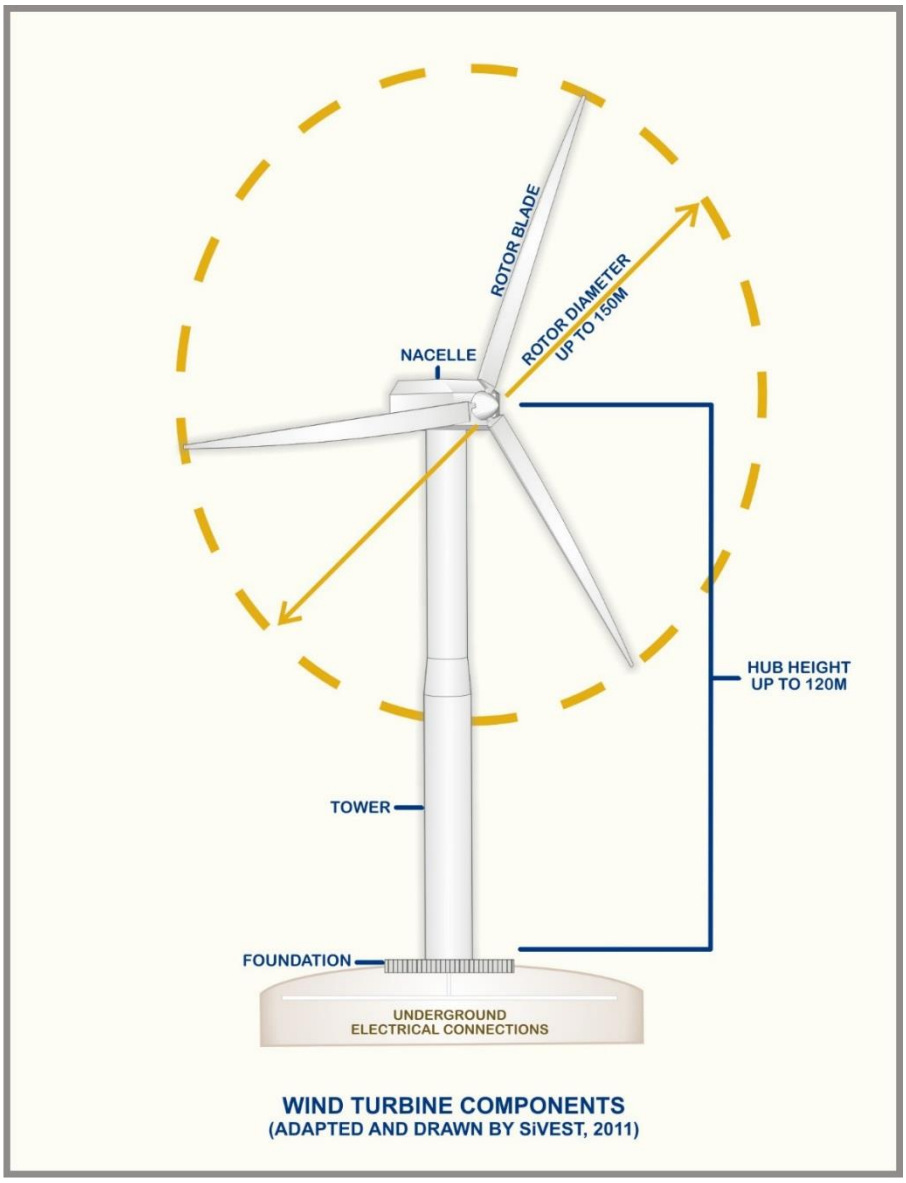

Figure i. Example of a Wind Turbine.

STRUCTURE ORIENTATION: Wind Turbines - The turbine blades will not be fixed and will be able to rotate in order to catch the prevailing winds.

FOUNDATION DIMENSIONS: Each wind turbine, depending on geotechnical conditions, will have a foundation diameter of up to 20m, and will be approximately 3m deep. The area occupied by each wind turbine will be up to 0.5 hectares (85m x 60m). The excavation area, depending on geotechnical conditions, will be approximately 1 000m² in sandy soils due to access requirements and safe slope stability requirements.

BLADE ROTATION DIRECTION: This will be provided during the EIA phase of the project.

EXPORT CAPACITY: The project will have a total export capacity of 140MW.

A3 Maps of all smaller maps included in the report are included in Appendix 5.

BIOTHERM ENERGY

PROPOSED CONSTRUCTION OF THE ALETTA 140MW WIND ENERGY FACILITY NEAR COPPERTON, NORTHERN CAPE PROVINCE

FINAL SCOPING REPORT

Executive Summary

BioTherm Energy (Pty) Ltd (hereafter referred to as BioTherm) intends to develop the Aletta wind energy facility and associated infrastructure near Copperton, Northern Cape Province of South Africa. SiVEST Environmental Division has been appointed as independent consultants to undertake the Environmental Impact Assessment (EIA) for the proposed energy facility and associated infrastructure. The overall objective of the project is to generate electricity to feed into the National Grid. The proposed project will consist of a 140MW export capacity wind energy facility.

Additionally, BioTherm are proposing to develop the associated Aletta substation and power line, both with a capacity of up to 132kV. This associated electrical infrastructure will require a separate Environmental Authorisation and is being conducted as a part of a separate Basic Assessment (BA) process. The Aletta power line has been included in the wind energy facility EIA for background information but will be authorised under a separate BA to allow for handover to Eskom. The Aletta onsite substation will include an Eskom portion and an Independent Power Producer (IPP) portion, hence the substation has been included in the wind energy facility EIA and in the substation and power line BA to allow for handover to Eskom. Although the wind energy facility and the electrical infrastructure will be assessed separately, a single public participation process is being undertaken to consider both of the proposed developments. The potential environmental impacts associated with both developments will be assessed as part of the cumulative impact assessment. The DEA reference number allocated for the Aletta substation and power line has not yet been allocated by the DEA. This will be provided in the Final Environmental Impact Assessment Report (FEIAr).

The proposed development requires Environmental Authorisation from the Department of Environmental Affairs (DEA). However, the provincial authority will also be consulted (i.e Northern Cape Department of Environment and Nature Conservation (NC DENC)). The EIA for the proposed development will be conducted in terms of the EIA Regulations promulgated in terms of Chapter 5 NEMA (National Environmental Management Act), which came into effect on the 8th of December 2014. In terms of these regulations, a full EIA is required for the proposed project. All relevant legislations and guidelines (including Equator Principles) will be consulted during the EIA process and will be complied with at all times.

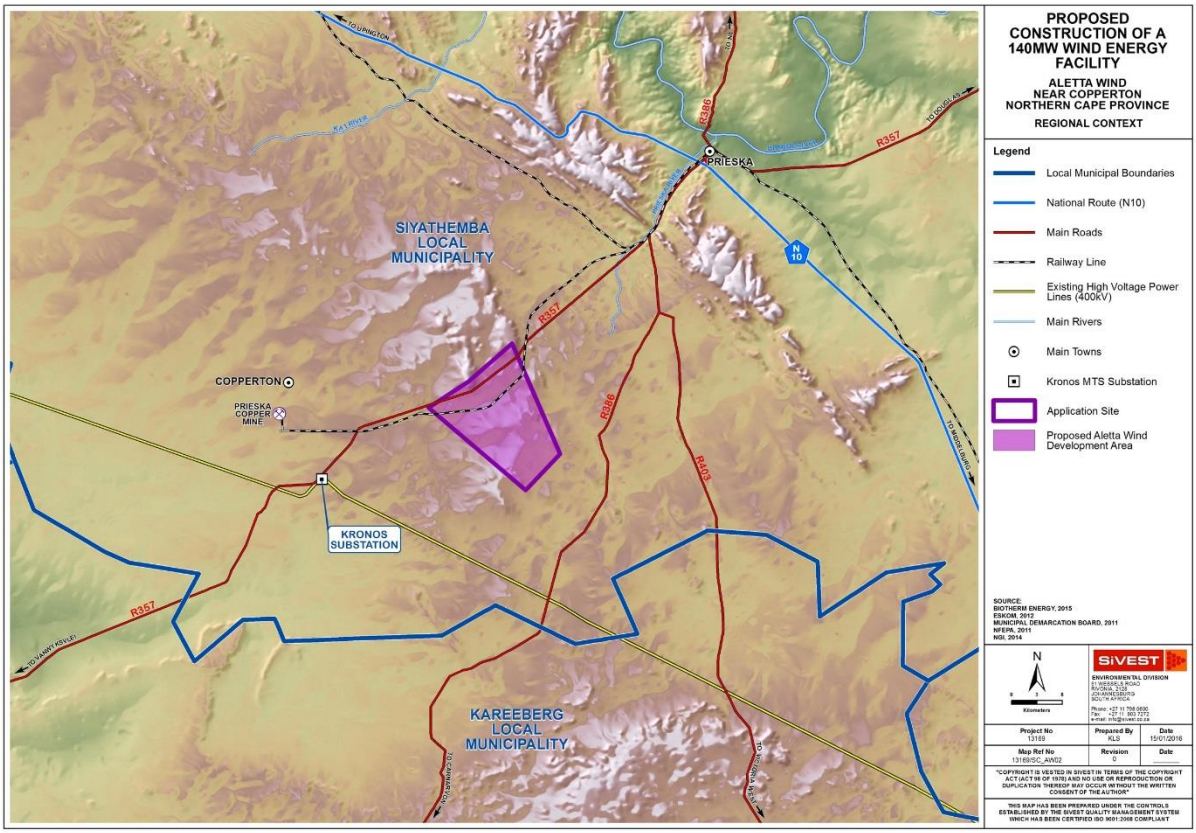

Figure ii: Regional context for the proposed Aletta wind energy facility

ALETTA WIND: APPLICATION SITE & DEVELOPMENT AREA		
CORNER POINT COORDINATES		
POINT	**SOUTH**	**EAST**
A_01 (NW)	S29° 52' 51.794"	E22° 32' 27.848"
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A_04 (SW)	S29° 56' 56.872"	E22° 27' 9.065"

Refer to Appendix 8A for the full project coordinates.

The following assessments were conducted during the scoping phase to identify and assess the issues associated with the proposed development:

- Biodiversity Assessment
- Avifauna Assessment (including preconstruction monitoring)

- Bat Assessment (including preconstruction monitoring)
- Surface Water Impact Assessment
- Soils and Agricultural Potential Assessment
- Noise Assessment
- Visual Impact Assessment
- Heritage Assessment
- Socio-economic Impact Assessment
- Topographical Analysis Assessment to the SKA
- Radiation Emissions Path Loss and Risk Assessment
- Traffic Assessment

These studies were also undertaken to inform the impact assessment to take place in the EIA phase of the project. In the scoping phase the specialists assessed the entire application site (Portions 1, 2, 3 and the Remainder of the farm Drielings Pan No 101), during the EIA phase the specialist reports will assess specific impacts of the proposed turbine locations and wind energy facility infrastructure in detail.

Based on the scoping studies which were conducted, a few potentially sensitive sites have been identified within the study area. These have informed the preliminary assessment of layout alternatives which are included in Chapter 7 and will be further assessed during the EIA phase. The table below summarises the specialist findings of the Scoping Report for the entire project.

Biodiversity	The biodiversity specialist report concludes that the project is unlikely to have highly significant impacts on the ecological receiving environment and impacts that will occur can be controlled and reduced to low significance.. The seriousness of many of these impacts can be determined during the field investigation of the site. Some impacts require permits to be issued, either by National or Provincial authorities and field data is required for the permit applications.
Avifauna	One year of pre-construction monitoring is being undertaken on the proposed site, the first field monitoring was conducted in August 2015. Displacement of priority species due to disturbance during construction phase is likely to be a temporary medium negative impact, but can be reduced to low with the application of mitigation measures. Displacement of priority species due to habitat destruction during construction phase is likely to be a medium negative impact and will remain so, despite the application of mitigation measures. Displacement of priority species due to disturbance during operational phase is likely to be of low significance and it could be further reduced through the application of mitigation measures. Collisions of priority species with the turbines in the operational phase are likely to be a high negative impact but it could be reduced to medium negative through the application of mitigation measures.
Bats	The study area was visited over the winter and spring seasons of 2015 as part of the bat sensitivity study. During the day, site habitats and features were investigated and

	long-term bat monitoring systems were installed for the purpose of the 12-month preconstruction bat sensitivity study. The data from the passive monitoring systems will be used to identify bat species at risk of fatality to wind turbines, and patterns in their activity and distributions (temporal and spatial). Active monitoring, by means of transects, was carried out over July and October 2015. There was a significant contrast in the number of bat passes detected between the different seasons. Three different bat species were detected in October 2015 namely, *Neoromicia capensis, Tadarida aegyptiaca* and *Eptesicus hottentotus*. These species are commonly found within the Cape region of South Africa.
Surface water	Database and desktop findings were scrutinised to determine the number of surface water resources for the proposed development. Findings were consolidated in the desktop level assessment using information initially obtained via the database assessment. It was determined that the following surface water resources were identified on the proposed development site: ▪ Ten watercourses (drainage lines) ▪ Twenty seven wetlands: Twenty six depression wetlands and one man-made impoundment. It was identified that several potential impacts may affect the surface water resources within the proposed development site where construction activities encroach or are in close proximity to identified surface water resources.
Soils and Agricultural Potential	Virtually all of the study area comprises shallow, often calcareous soils with rock outcrops. Coupled with these shallow soils, the very low rainfall in the area means that the only means of cultivation would be by irrigation and the Google Earth image of the area shows absolutely no signs of any agricultural infrastructure and certainly none of irrigation. The climatic restrictions mean that this part of the Northern Cape is suited at best for grazing and here the grazing capacity is low, around 20 ha/large stock unit.
Noise	The results of this scoping study indicated that the establishment of the proposed wind energy facility could have acoustical implications on noise sensitive receptors in terms of SANS 10238.
Visual	A scoping-level visual study has been conducted to identify the potential visual impact and issues related to the development of the Aletta Wind Energy Facility and associated infrastructure near Copperton in the Northern Cape Province. The study area has a rural or pastoral visual character with a low visual sensitivity. Additionally, the study area is not valued for its tourism significance. However, several wind and solar energy facilities are proposed within relatively close proximity to the proposed development. These facilities and their associated infrastructure, will significantly alter the visual character and baseline in the study area once constructed and make it appear to have a more industrial-type visual character. The proposed wind energy facility development is likely to visually influence nineteen (19) farmsteads /

	homesteads identified within the visual assessment zone, therefore these are regarded as potentially sensitive visual receptor locations. The sensitivity of the receptor locations will need to be confirmed through further assessment in the next phase of the study. The nature of the visual impacts associated with a development of this size on a receptors in the study area could be significant.
Heritage	The Heritage Scoping Report has shown that the proposed Aletta wind energy facility project may have heritage resources present on the property. This has been confirmed through archival research and evaluation of aerial photography of the sites. Evaluation of aerial photography has indicated the area that may be sensitive from an archaeological perspective. The heritage sensitivity indicated the possibility of encountering heritage sites that will require further mitigation before construction commence.
Socio-economic	No fatal flaws or contraventions from a socio-economic policy perspective exist for the implementation of the proposed project. The national, provincial, and to some extent local governments, do prioritise the development of renewable energy projects to reduce carbon emissions, create new jobs, increase economic growth and security of electricity supply. However, it is very clear that these developments need to be undertaken in a sustainable manner and should not jeopardise the growth of the other sectors; mainly agriculture, which is considered to be an economic driver in the local area, where the project is to be developed. Instead, harnessing of renewable energy sources is considered to be the means to drive development and expansion of the local agricultural activities and development of other industries. The economy is in dire need for investment that would diversify its economic base and lead to the improvement of standards of living among local households through the increased income levels and access to improved services, which can be achieved by raising the local municipality's revenue base through taxes and rates paid by new businesses. The proposed project is therefore, likely to create a positive impact on the local economic development and the socio-economic environment in the municipality in general.
Radiation Emissions (SKA)	The initial high level risk assessment was conducted to enable one to estimate the maximum permissible radiated emissions from the equipment installed within the Aletta wind energy facility, compared to known radiated emission data from the Acciona AW125/3000 Wind Turbine Generator (WTG). Acciona AW125/3000 WTG is a large turbine type and was used to show the typical impacts of a similar technology and sized turbine. The report concluded that based on the current SKA location information, a first order impact analysis shows a possible interference scenario between the Aletta wind energy facility and the nearest SKA installation at 21.43km separation distance. Mitigation measures were included to maintain impacts below an acceptable level. ITC noted that Shielding and filtering solutions are available to ensure installed plant equipment emissions remain within SKA risk tolerances.

	SKA was provided with the MESA and ITC assessments and the initial Aletta turbine layout. SKA stated that as it stands the facility posed a high risk to the SKA and that a detailed emission measurements campaign must be conducted and an Emissions Control Plan, which provides sufficient evidence and proof of the mitigation required and that it is technically achievable must be compiled. BioTherm appointed ITC to conduct a detailed Path Loss and Risk Assessment including an Emissions Control Plan (ECP) to address the mitigation actions required to reduce the radiation emissions of the wind turbine generator levels to levels acceptable for installation within the Karoo Central Astronomy Advantage Area. The assessment and ECP was based on the 60 turbine layout which is proposed to be further assessed during the EIA phase. The 60 turbine layout not only reduces the number of turbines but also increases the distance from the closest turbine to the closest SKA infrastructure from 20km to 25km. ITC previously worked on the Copperton and Garob Wind Energy Facilities of which were selected as Preferred Bidders under Round 4.5 of the REIPPP program. Both these Wind Energy Facilities are adjacent to the proposed Aletta Wind Energy Facility. The detailed Path Loss and Risk Assessment and ECP were completed during the scoping phase. It was found that the current requirement is a 30dB reduction in radiated emissions to ensure the cumulative emission level of a wind farm is within the requirements of SKA. As a working system was available for measurements, actual values were used rather than a theoretic analysis. Tests were done on a current wind turbine generator to confirm the suspected noise sources. The results indicated that shielding is required at frequencies in the FM Radio band as well as other controlled frequency bands, especially in the nacelle area. A number of mitigation solutions were recommended which include; implanting shield wires, control loop areas, ferrites land absorbers and improving shielding. It was concluded that by implementing the suggested mitigation measures, the impact on the SKA project will be reduced. Where possible, the mitigation measures will be verified by means of laboratory tests and ambient measurements should be done at the new site before construction starts.
Traffic	All the components will be transported by truck from Saldanha harbour to the site on vehicles classified as oversize vehicles and permits must be obtained in order to transport the turbine components. The access to the site is off road R357 which is a Provincial road and will necessitate the involvement of the Northern Cape Provincial roads and transport department. SANRAL Western Region will also need to be contacted in order to obtain consent for the abnormal load transport on their

	roadways. Adequate traffic accommodation signage must be erected and maintained on either side of the access on road R357 throughout the construction period. The impact of the construction traffic on the general traffic and the surrounding communities along the haulage route was considered to be low. The development of Aletta WEF on the Farm Drielings Pan 101 in the Northern Cape Province was therefore supported from a traffic engineering perspective.

Based on the above mentioned studies, the Scoping Report has identified several aspects that warrant further investigation in the EIA Phase. These are as follows:

- Biodiversity Assessment
- Avifauna Assessment
- Bat Assessment
- Surface Water Impact Assessment
- Soils and Agricultural Potential Assessment
- Noise Assessment
- Visual Impact Assessment
- Heritage Assessment
- Socio-economic Impact Assessment\
- Traffic Assessment

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PROPOSED CONSTRUCTION OF THE ALETTA 140MW WIND ENERGY FACILITY NEAR COPPERTON, NORTHERN CAPE PROVINCE

FINAL SCOPING REPORT

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Glossary of Terms

Alluvial: Resulting from the action of rivers, whereby sedimentary deposits are laid down in river channels, floodplains, lakes, depressions etc.

Biodiversity: The variety of life in an area, including the number of different species, the genetic wealth within each species, and the natural areas where they are found.

Cultural Significance: This means aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance.

Cumulative Impact: In relation to an activity, cumulative impact means the impact of an activity that in itself may not be significant, but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area.

"Equator Principles": A financial industry benchmark for determining, assessing and managing social & environmental risk in project financing.

Environmental Impact Assessment: In relation to an application, to which Scoping must be applied, means the process of collecting, organising, analysing, interpreting and communicating information that is relevant to the consideration of the application.

Environmental Impact Report: In-depth assessment of impacts associated with a proposed development. This forms the second phase of an Environmental Impact Assessment and follows on from the Scoping Report.

Environmental Management Programme: A legally binding working document, which stipulates environmental and socio-economic mitigation measures which must be implemented by several responsible parties throughout the duration of the proposed project.

Heritage Significance Grades:
a) Grade I: Heritage resources with qualities so exceptional that they are of special national significance;
(b) Grade II: Heritage resources which, although forming part of the national estate, can be considered to have special qualities which make them significant within the context of a province or a region; and
(c) Grade III: Other heritage resources worthy of conservation.

Heritage Resources: This means any place or object of cultural significance. See also archaeological resources above.

Historical Period: Since the arrival of the white settlers - c. AD 1840 - in this part of the country

Iron Age: Period covering the last 1800 years, when new people brought a new way of life to southern Africa. They established settled villages, cultivated domestic crops such as sorghum, millet and beans, and they herded cattle as well as sheep and goats. These people, according to archaeological evidence, spoke early variations of the Bantu Language. Because they produced their own iron tools, archaeologists call this the Iron Age.
Early Iron Age AD 200 - AD 900
Middle Iron Age AD 900 - AD 1300
Late Iron Age AD 1300 - AD 1830

Kilovolt (kV): a unit of electric potential equal to a thousand volts (a volt being the standard unit of electric potential. It is defined as the amount of electrical potential between two points on a conductor carrying a current of one ampere while one watt of power is dissipated between the two points).

Precipitation: Any form of water, such as rain, snow, sleet, or hail that falls to the earth's surface.

Red Data Species: All those species included in the categories of endangered, vulnerable or rare, as defined by the International Union for the Conservation of Nature and Natural Resources.

Riparian: The area of land adjacent to a stream or river that is influenced by stream induced or related processes.

Scoping Report: An “issues-based” report which forms the first phase of an Environmental Impact Assessment process.

Stone Age: The first and longest part of human history is the Stone Age, which began with the appearance of early humans between 3-2 million years ago. Stone Age people were hunters, gatherers and scavengers who did not live in permanently settled communities. Their stone tools preserve well and are found in most places in South Africa and elsewhere.
Early Stone Age 2 000 000 - 150 000 Before Present
Middle Stone Age 150 000 - 30 000 BP
Late Stone Age 30 000 - until c. AD 200

List of Abbreviations

AP	- Action Plan
BID	- Background Information Document
CARA	- Conservation of Agricultural Resources Act
CBA	- Critical Biodiversity Area
CISPR	- International Special Committee of Radio Interferences
DEA	- Department of Environmental Affairs
DEIAr	- Draft Environmental impact Assessment Report
DSR	- Draft Scoping Report
DoE	- Department of Energy
DM	- District Municipality
DWS	- Department of Water and Sanitation
EAP	- Environmental Assessment Practitioner
ECA	- Environmental Conservation Act No 73 of 1989
ECP	- Emmissions Control Plan
EHS	- Environmental, Health, and Safety
EIA	- Environmental Impact Assessment
EIR	- Environmental Impact Report
EMPr	- Environmental Management Programme
EMI	- Electromagnetic Interference
EP	- Equator Principles
EPFI	- Equator Principles Financial Institutions
ERA	- The Electricity Regulation Act No. 4 of 2006
ESA	- Ecological Support Area
FGM	- Focus Group Meeting
FSR	- Final Scoping Report
GDP	- Gross Domestic Product
GIIP	- Good International Industry Practice
GIS	- Geographic Information System
GW	- Gigawatts
HIA	- Heritage Impact Assessment
I&AP(s)	- Interested and Affected Parties
IBA(s)	- Important Bird Area(s)
IDP	- Integrated Development Plan
IEP	- Integrated Energy Plan
IFC	- International Finance Corporation
IPP(s)	- Independent Power Producers
IRP	- Integrated Resource Plan
IUCN	- International Union for the Conservation of Nature and Natural Resources
KSW	- Key Stakeholder Workshop

kV	- Kilo Volt
LM	- Local Municipality
LOS	- Level of Service
MSA	- Middle Stone Age
MW	- Megawatt
NEA	- The National Energy Act No. 34 of 2008
NEMA	- National Environmental Management Act No. 107 of 1998
NEMBA	- National Environmental Management: Biodiversity Act No. 10 of 2004
NHRA	- National Heritage Resources Act No. 25 of 1999
NSBA	- National Spatial Biodiversity Assessment
NWA	- National Water Act No. 36 of 1998
NEMAA	- National Environmental Management: Air Quality Act of 2004
NPAES	-National Parks Area Expansion Strategy
OHL	-Overhead Line
OHSA	- Occupational Health and Safety Act No. 85 of 1993
PoS	- Plan of Study
PM	- Public Meeting
PPA	- Power Purchase Agreement
PPP	- Public Participation Process
RFI	- Radio Frequency Interference
RFP	- Request for Proposals
RFQ	- Request for Qualifications
SA	- South Africa
SAHRA	- South African Heritage Resources Agency
SALT	- Southern African Large Telescope
SANBI	- South African National Biodiversity Institute
SDF	- Spatial Development Framework
SKA	- Square Kilometre Array
SPVs	- Special Purpose Vehicles
SR	- Scoping Report
TL	- Terrain Loss
WETFEPA	- Wetland Freshwater Priority Areas

BIOTHERM ENERGY

PROPOSED CONSTRUCTION OF THE ALETTA 140MW WIND ENERGY FACILITY NEAR COPPERTON, NORTHERN CAPE PROVINCE

FINAL SCOPING REPORT

1 INTRODUCTION

BioTherm Energy (Pty) Ltd (hereafter referred to as BioTherm) intends to develop the Aletta wind energy facility and associated infrastructure near Copperton, Northern Cape Province of South Africa (**Figure 1**). SiVEST Environmental Division has been appointed as independent environmental assessment practitioner (EAP) to undertake the Environmental Impact Assessment (EIA) for the proposed energy facility and associated infrastructure. The overall objective of the project is to generate electricity to feed into the National Grid. The proposed project will consist of a 140MW export capacity wind energy facility.

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The proposed development requires Environmental Authorisation from the Department of Environmental Affairs (DEA). However, the provincial authority will also be consulted (i.e Northern Cape Department of Environment and Nature Conservation (NC DENC)). The EIA for the proposed development will be conducted in terms of the EIA Regulations promulgated in terms of Chapter 5 NEMA (National Environmental Management Act), which came into effect on the 8th of December 2014. In terms of these regulations, a full EIA is required for the proposed project. All relevant legislations and guidelines (including Equator Principles) will be consulted during the EIA process and will be complied with at all times.

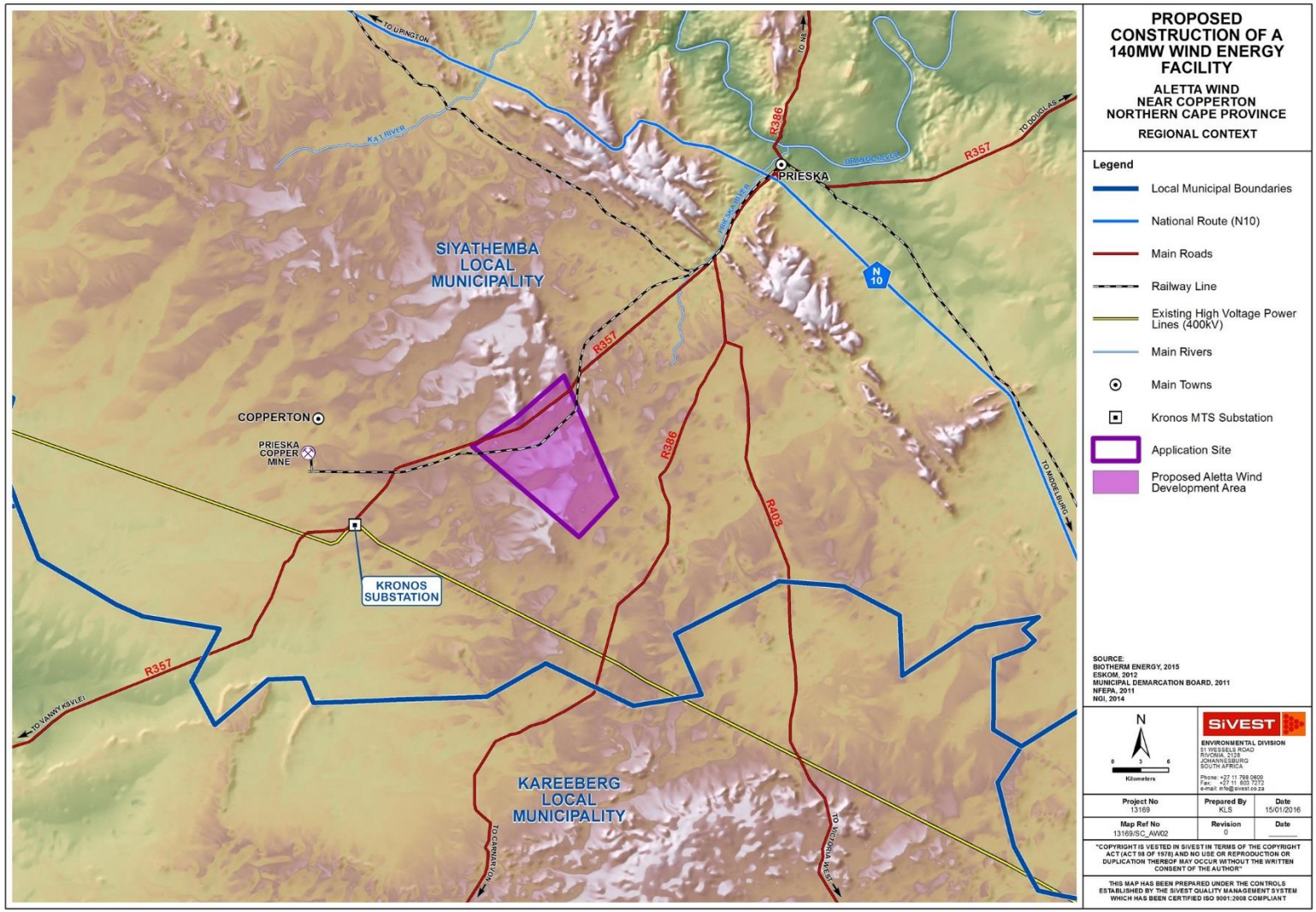


Figure 1: Regional context for the proposed Aletta wind energy facility

As previously mentioned, this Scoping Report is compiled in accordance with the Equator Principles (EP), which is a financial industry benchmark for determining, assessing and managing social and environmental risk in project financing (Equator Principles, 2013). This proposed development is considered a Category B project, which are those with potential limited adverse social or environmental impacts that are few in number, generally site-specific, largely reversible and readily addressed through mitigation measures (Equator Principles, 2013). The project will also comply with the International Finance Corporation's (IFC) Social and Environmental Performance Standards (2012) and General Environmental Health and Safety (EHS) Guidelines (2007).

1.1 Objectives of the Scoping Phase

The NEMA EIA Regulations (GN. R. 982) state that the objective of the scoping phase is to:

(a) identify the relevant policies and legislation relevant to the activity;
(b) motivate the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the preferred location;
(c) identify and confirm the preferred activity and technology alternative through an impact and risk assessment and ranking process;
(d) identify and confirm the preferred site, through a detailed site selection process, which includes an impact and risk assessment process inclusive of cumulative impacts and a ranking process of all the identified alternatives focusing on the geographical, physical, biological, social, economic, and cultural aspects of the environment;
(e) identify the key issues to be addressed in the assessment phase;
(f) agree on the level of assessment to be undertaken, including the methodology to be applied, the expertise required as well as the extent of further consultation to be undertaken to determine the impacts and risks the activity will impose on the preferred site through the life of the activity, including the nature, significance, consequence, extent, duration and probability of the impacts to inform the location of the development footprint within the preferred site; and
(g) identify suitable measures to avoid, manage or mitigate identified impacts and to determine the extent of the residual risks that need to be managed and monitored.

A scoping report must contain the information that is necessary for a proper understanding of the process, informing all preferred alternatives, including location alternatives, the scope of the assessment, and the consultation process to be undertaken through the environmental impact assessment process. The content requirements for a Scoping Report (as provided in Appendix 2 of the EIA Regulations 2014), as well as details of which section of the report fulfils these requirements, are shown in

Table 1 below.

Table 1: Content requirements for a Scoping Report

Content Requirements	Applicable Section
(a) details of- (i) the EAP who prepared the report; and (ii) the expertise of the EAP, including a curriculum vitae;	Details of the EAP and full project team are included in section 1.5 on page 10. The expertise (including curriculum vitae) of the EAP and full project team are include in Appendix 2.
(b) the location of the activity, including- (i) the 21 digit Surveyor General code of each cadastral land parcel; (ii) where available, the physical address and farm name; (iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties;	The location (including 21 digit Surveyor General codes) of the proposed project is detailed on page *i* of the report, as well as in section 0 on page 47.
(c) a plan which locates the proposed activity or activities applied for at an appropriate scale, or, if it is- (i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or (ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken;	A map of the regional locality is shown in section 5.1 on page 46, and the site locality is shown in section 0 on page 47. Additionally, all project maps are included in Appendix 5. Coordinates are shown on page *i* of the report, as well as in section 0 on page 47. Additionally, all coordinates are included in Appendix 8A.
(d) a description of the scope of the proposed activity, including- (i) all listed and specified activities triggered; (ii) a description of the activities to be undertaken, including associated structures and infrastructure;	The listed and specified activities triggered as per NEMA are detailed in section 3.1.2 on page 23. The technical project description is included in section 0 on page 14. This includes a description of activities to be undertaken, including associated structures and infrastructure.
(e) a description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process;	A description of all legal requirements and guidelines is provided in section 3 on page 23. This includes key legal and administrative requirements as well as key development strategies and guidelines.
(f) a motivation for the need and desirability for the proposed development including the need and desirability of the activity in the context of the preferred location;	The need and desirability of the proposed project is discussed in section 4 on page 41.

(h) a full description of the process followed to reach the proposed preferred activity, site and location within the site, including - (i) details of all the alternatives considered; (ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs; (iii) a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them; (iv) the environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects; (v) the impacts and risks identified for each alternative, including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts- (aa) can be reversed; (bb) may cause irreplaceable loss of resources; and (cc) can be avoided, managed or mitigated; (vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks associated with the alternatives; (vii) positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects; (viii) the possible mitigation measures that could be applied and level of residual risk; (ix) the outcome of the site selection matrix; (x) if no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such and (xi) a concluding statement indicating the preferred alternatives, including preferred location of the activity;	A description of the alternatives considered in terms of the Regulations is included in section 2.3 on page 19. A preliminary assessment of layout alternatives is included in section 7on page 198. The public participation process followed is detailed in section 8 on page 202. Additionally, all public participation documents are included in Appendix 7. This will include a summary of issues raised by I&APs, and the responses to their comments. A full description of the environmental attributes within the application site is included in section 5 on page 46. The impacts and risks associated with each alternative are assessed in section 7 on page 198. The methodology used in identifying the impacts and risks associated with each alternative is included in section 7 on page 198. The positive and negative impacts that the proposed activity will have on the environment are discussed in section 6.2 on page 126. Potential mitigation measures are included in section 6.3 on page 183. The outcome of the site selection matrix is included in section 4.4 on page 42. The inclusion of alternatives is discussed in section 2.3 on page 19, and in section 7on page 198. A concluding statement indicating the preferred alternatives is contained in section 7on page 198.
(i) a plan of study for undertaking the environmental impact assessment process to be undertaken, including- (i) a description of the alternatives to be considered and assessed within the preferred site, including the option of not proceeding with the activity;	The plan of study for the EIA phase is included in section 11 on page 229. A description of alternatives to be considered is included in section 11.8 on page 245. A

(ii) a description of the aspects to be assessed as part of the environmental impact assessment process; (iii) aspects to be assessed by specialists; (iv) a description of the proposed method of assessing the environmental aspects, including a description of the proposed method of assessing the environmental aspects including aspects to be assessed by specialists; (v) a description of the proposed method of assessing duration and significance; (vi) an indication of the stages at which the competent authority will be consulted; (vii) particulars of the public participation process that will be conducted during the environmental impact assessment process; and (viii) a description of the tasks that will be undertaken as part of the environmental impact assessment process; (ix) identify suitable measures to avoid, reverse, mitigate or manage identified impacts and to determine the extent of the residual risks that need to be managed and monitored.	summary of the aspects to be assessed is included in section 11.1 on page 229 and in section 11.3 on page 230. The description of the proposed EIA phase methodology is in section 11.3 on page 230. An indication of planned authority consultation is contained in section 11.2 on page 230. The particulars of the planned public participation process are included in section 11.10 on page 246. All tasks to be undertaken during the EIA phase are described in section 11 on page 229. Detailed mitigation measures will be included in the EIA phase of the project, following detailed specialist studies, as indicated in section 11.9 on page 246.
(j) an undertaking under oath or affirmation by the EAP in relation to- (i) the correctness of the information provided in the report; (ii) the inclusion of comments and inputs from stakeholders and interested and affected parties; and (iii) any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties;	The EAP affirmation is included in Appendix 3.
(k) an undertaking under oath or affirmation by the EAP in relation to the level of agreement between the EAP and interested and affected parties (I&APs) on the plan of study for undertaking the environmental impact assessment;	The plan of study is included within this FSR which has been made available for review and comment by I&APs. Should any I&APs identify any issues or concerns with respect to the plan of study for undertaking the EIA, it will be updated accordingly.
(l) where applicable, any specific information required by the competent authority; and	At this stage there is no specific information required by the competent authority. However a record of authority consultation is kept in section 1.4 on page 7, and should there be any specific

	information requested, this will be detailed in the same section.
(m) any other matter required in terms of section 24(4)(a) and (b) of the Act.	All requirements in terms of section 24(4)(a) and (b) of the Act have been met in this report.

1.2 Applicable Documentation

The following documentation should be read in conjunction with this Scoping Report:

- "Equator Principles" 2013
- International Finance Corporation's (IFC) Performance Standards on Social and Environment, January 2012, namely:
    - Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts
    - Performance Standard 2: Labour and Working Conditions
    - Performance Standard 3: Resource Efficiency and Pollution Prevention
    - Performance Standard 4: Community Health, Safety and Security
    - Performance Standard 5: Land Acquisition and Involuntary Resettlement
    - Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources
    - Performance Standard 7: Indigenous Peoples
    - Performance Standard 8: Cultural Heritage
- International Finance Corporation – World Bank Guidelines, General Environmental Health and Safety (EHS) Guidelines 2007.

The EHS Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP). These EHS Guidelines are applied as required by the World Bank's respective policies and standards. These General EHS Guidelines are designed to be used together with the relevant Industry Sector EHS Guidelines which provide guidance to users on EHS issues in specific industry sectors. The IFC handbook is contained in Appendix 1.

1.3 Specialist Studies

Specialist studies have been conducted in terms of the stipulations contained within Appendix 6 of the 2014 NEMA EIA regulations.

The following specialist studies have been conducted to assess the site:

- Biodiversity Assessment

- Avifauna Assessment (including preconstruction monitoring)
- Bat Assessment (including preconstruction monitoring)
- Surface Water Impact Assessment
- Soils and Agricultural Potential Assessment
- Noise Impact Assessment
- Visual Impact Assessment
- Heritage Assessment
- Socio-economic Assessment
- Traffic Assessment
- Topographical Analysis Assessment to the SKA
- Radiation Emissions Path Loss and Risk Assessment including an Emissions Control Plan

These studies have been used to identify issues at a scoping level and will be supplemented with more site specific studies during the EIA phase of the project. Key issues relating to the proposed site are discussed below in section 5.

1.4 Authority Consultation

The National Department of Environmental Affairs (DEA) is the competent authority on this project. As such an application for environmental authorisation (EA) for the proposed development was submitted to DEA on the 30th of June 2016. A proof of payment, details of the EAP and declaration of interest, a project schedule, details of landowners, and locality map formed part of the application form and were submitted accordingly on the same date. The DSR was also submitted to the DEA on the 30th of June 2016 and an acknowledgement of receipt was received on the 5th of July 2016. The project was allocated the reference number 14/12/16/3/3/2/945. The DEA provided comments on the DSR on the 20th of July 2016. The table below provides details as to how this FSR addresses the comments made by the DEA in the DSR comment letter. For further details, refer to Appendix 4 for the DSR comment Letter.

Table 2: Compliance with the DEA requirements detailed in the DSR comment letter

Comment made by the DEA	Notes / Comments
i. Please ensure that all relevant listed activities are applied for, are specific and that it can be linked to the development activity or infrastructure as described in the project description.	All listed activities that have been applied for are tabulated in section 3.1.2. The table describes how each listed activity is triggered in terms of the project description included in section 2.
ii. If the activities applied for in the application form differ from those mentioned in the final SR, an amended application form must be submitted. Please note that the Department's application form template has been amended and can be downloaded from the following link	The activities applied for in the application form are exactly the same as those included in the FSR. If any changes to the list of activities applied for are required the updated application form will be submitted accordingly.

	https://www.environment.gov.za/documents/forms	
iii.	The final SR must investigate and identify all traffic impacts associated with the proposed development.	A traffic assessment has been undertaken by BVi Consulting Engineers and is included in the FSR, see section 5.16. The full traffic assessment is included in Appendix 6J. A detailed EIA phase traffic impact assessment will also be included in the DEIAr. See the plan of study for the EIA phase shown in section 11.
iv.	Please ensure that all issues raised and comments received during the circulation of the SR from registered I&APs and organs of state which have jurisdiction (including this Department's Biodiversity Section) in respect of the proposed activity are adequately addressed in the final SR. Proof of correspondence with the various stakeholders must be included in the final SR. Should you be unable to obtain comments, proof should be submitted to the Department of the attempts that were made to obtain comments.	All comments on the DSR that were received from I&APs and organs of state have been captured in the Comments and Response Report which is included in Appendix 7E. Where necessary these comments have been addressed in the FSR. Proof of correspondence is included in Appendix 7B, 7D and 7I. Where comments were not obtained the details of the attempts to gain comment are included in section 8.12.
v.	The Public Participation Process must be conducted in terms of Regulation 39, 40, 41, 42, 43 & 44 of the EIA Regulations 2014.	The public participation process is being conducted in terms of Regulations 39, 40, 41, 42, 43 & 44 of the EIA Regulations 2014.
vi.	Please provide a description of any identified alternatives for the proposed activity that are feasible and reasonable, including the advantages and disadvantages that the proposed activity or alternatives will have on the environment and on the community that may be affected by the activity as per Appendix 2 of the EIA Regulations, 2014. Alternatively, you should submit written proof of an investigation and motivation if no reasonable or feasible alternatives exist in terms of Appendix 2.	The consideration of alternatives in terms of Chapter 1 of the EIA Regulations, 2014, is discussed in detail in section 2.3. Layout alternatives are discussed in section 7 and the alternatives to be further assessed in the EIA phase are shown in section 11.8.
vii.	The detailed emission campaign and Emissions Control Plan to be undertaken by ITC must be submitted to and comments sought from the Square Kilometre Array (SKA) office. The final SR must include the said comments and report.	The detailed Path Loss and Risk Assessment as well as the ECP have been completed and are discussed in section 3.1.15. The full report has also been included in Appendix 8C. The SKA office has been provided with the report and once comments are received, they will be sent to the DEA and included in

		the Draft and Final Environmental Impact Assessment Reports.
viii.	The desktop Soils and Agricultural Potential Assessment dated January 2016 by ACR – Institute for Soil, Climate and Water and annexed as Appendix 6E is noted. However, since this was a desktop assessment, this Department requires a Soils and Agricultural Potential Assessment with thorough ground truthing and with the following terms of reference to be undertaken: • Assessment of the loss of agricultural land; • The current state of agricultural activities on land; • The impact of the loss of agricultural land within the property as well as the cumulative impact of the loss of agricultural land on the site and within the area.	The agricultural scoping report found that "due to the occurrence of shallow soils, coupled with the extremely hot and dry nature of the climate, it is not anticipated that a detailed soil survey will be required", and the DSR therefore recommended that no further investigations be conducted. However, at the request of the DEA a detailed soils and agricultural potential assessment, including fieldwork, will be conducted during the EIA phase. See the plan of study for the EIA phase shown in section 11.
ix.	Detailed cumulative impact assessment must be provided in the EIAr for all specialist studies conducted. The specialist studies must provide proof of other specialist reports reviewed that were conducted for renewable energy projects in the area and indicate how the recommendations, mitigation measures and conclusions have been taken into consideration when the conclusion and mitigation measures were drafted for this project.	The EIA phase specialist reports will include a detailed cumulative impact assessment, including a review of other specialist studies conducted for renewable energy projects in the area. The recommendations contained in the specialist reports will be reflected in the mitigation measures to be provided in the DEIAr and EMPr.
x.	In accordance with Appendix 2 of the EIA Regulations of 2014, the details of – *(i) the EAP who prepared the report, and* *(ii) the expertise of the EAP to carry out Scoping and Environmental Impact assessment procedures* must be submitted	The full CVs of the EAPs and specialists involved in the preparation of the report are included in Appendix 2 of the FSR. Additionally, a summary of the experience of the EAPs involved in writing the FSR is tabulated in section 1.5.
xi.	You are further reminded that the final SR to be submitted to this Department must comply with all the requirements in terms of the scope of assessment and content of Scoping reports in accordance with Appendix 2 and Regulation 21(1) of the EIA Regulations, 2014.	Section 1.1 details the objectives of the scoping phase as per Appendix 2 of GN R 982 of the EIA Regulations, 2014, including a tabulated list of all of the required content of a scoping report and an indication as to where in the report all of the required content can be found.

xii.	Further note that in terms of Regulation 45 of the EIA Regulations 2014, this application will lapse if the applicant fails to meet any of the timeframes prescribed in terms of these Regulations, unless an extension has been granted in terms of Regulation 3(7).	All regulated timeframes will be adhered to.

1.5 Expertise of Environmental Assessment Practitioner

SiVEST has considerable experience in the undertaking of EIAs. Staff and specialists who have worked on this project and contributed to the compilation of this Scoping Report are detailed in **Table 3** below.

Table 3: Project Team

Name and Organisation	Role
Andrea Gibb – SiVEST	EAP and Visual
Lynsey Rimbault – SiVEST (until 31 July 2016)	Environmental Consultant / Public Participation Practitioner
Stephan Jacobs - SiVEST	Visual
David Hoare – David Hoare Consulting	Biodiversity
Chris van Rooyen – Chris van Rooyen Consulting	Avifauna
Werner Marais – Animalia	Bats
Shaun Taylor – SiVEST	Surface Water
D.G. Paterson – ARC Institute for Soil, Climate and Water	Agricultural Potential
Adrian Jongens – Jongens Keet Associates	Noise
Wouter Fourie – PGS	Heritage
Ruan Fourie – Urban-Econ Development Economists	Socio-economic
Elena Broughton – Urban-Econ Development Economists	Socio-economic
Paul van der Merwe – MESA Solution (Pty) Ltd (MESA)	Topographical Analysis
Callie Fouché – Interference Testing and Consultancy Services (Pty) Ltd (ITC)	Radiation Emissions Path Loss and Risk
Dirk van der Merwe – BVi Consulting Engineers	Traffic
Nicolene Venter – Zitholele Consulting	Senior Public Participation Practitioner
Kerry Schwartz – SiVEST	GIS and Mapping and Visual

As per the requirements of the NEMA (2014), the details and level of expertise of the persons who prepared the FSR are provided in Table 4 below.

Table 4: Expertise of the EAP

Environmental Practitioner	SiVEST (Pty) Ltd – Andrea Gibb
Contact Details	andreag@sivest.co.za
Qualifications	BSc Landscape Architecture and BSc (Hons) Environmental Management
Expertise to carry out the EMPr	Andrea has 8.5 years' work experience and specialises in undertaking and managing Environmental Impact Assessments (EIAs) and Basic Assessment (BAs), primarily related to energy generation and electrical distribution projects. She also specialises in undertaking visual impact and landscape assessments, by making use of ArcGIS technology and field surveys. She has extensive experience in overseeing public participation and stakeholder engagement processes and has been involved in environmental baseline assessments, fatal flaw / feasibility assessments and environmental negative mapping / sensitivity analyses. From a business and administrative side, Andrea is actively involved in maintaining good client relationships, mentoring junior staff and maintaining financial performance of the projects she leads. **Environmental Impact Assessments and Basic Assessments:** ▪ EIA for the proposed construction of a 75MW Solar Photovoltaic (PV) Power Plant near Dennilton, Limpopo Province. ▪ EIA for the proposed development of the Dwarsrug Wind Farm near Loeriesfontein, Northern Cape Province. ▪ BA for the proposed construction of two 132kV power lines and associated infrastructure from the Redstone Solar Thermal Power Project site to the Olien MTS near Lime Acres, Northern Cape Province. ▪ BA for the proposed construction of two 132kV power lines and associated infrastructure from Silverstreams DS to the Olien MTS near Lime Acres, Northern Cape Province. ▪ BA for the proposed Construction of the SSS1 5MW Solar Photovoltaic (PV) Plant on the Western Part of Portion 6 (Portion of Portion 5) of Farm Spes Bona 2355 near Bloemfontein, Free State Province. ▪ BA for the proposed Construction of the SSS2 5MW Solar Photovoltaic (PV) Plant on the Eastern Part of Portion 6 (Portion of Portion 5) of Farm Spes Bona 2355 near Bloemfontein, Free State Province. ▪ BA for the proposed Mookodi Integration Phase 2: Proposed Construction of a 132kV power line from the proposed Bophirima Substation to the existing Schweizer-Reneke Substation, North West Province. ▪ BA for the proposed Mookodi Integration Phase 2: Proposed Construction of a 132kV power line from the Mookodi Substation to the existing Magopela Substation, North West Province. ▪ BA for the proposed Mookodi Integration Phase 2: Proposed Construction of the Mookodi - Ganyesa 132kV power line, proposed Ganyesa Substation and Havelock LILO, North West Province. ▪ Amendment of the Final Environmental Impact Report for the Proposed

	Mookodi 1 Integration Project near Vryburg, North West Province. ▪ BA for the proposed 132kV power line and associated infrastructure for the proposed Redstone Solar Thermal Energy Plant near Lime Acres, Northern Cape Province. ▪ BA for the proposed construction of a 132kV power line and substation associated with the 75MW Photovoltaic (PV) Plant on the Farm Droogfontein (PV 3) in Kimberley, Northern Cape Province. ▪ BA for the proposed establishment of a Learning and Development Retreat and an Executive Staff and Client Lodge at Mogale's Gate, Gauteng Province. ▪ Amendment application in order to increase the output of the proposed 40MW PV Facility on the farm Mierdam to 75MW, Northern Cape Province. ▪ BA for the proposed construction of a power line and substation near Postmasburg, Northern Cape Province. ▪ BA for the proposed West Rand Strengthening Project – 400kV double circuit power line and substation extension in the West Rand, Gauteng. ▪ EIA for the proposed construction of a wind farm and PV plant near Prieska, Northern Cape Province. ▪ Public Participation assistance as part of the EIA for the proposed Thyspunt Transmission Lines Integration Project – EIA for the proposed construction of 5 x 400kV transmission power lines between Thyspunt to Port Elizabeth, Eastern Cape Province. ▪ EIA assistance for the proposed construction of three Solar Power Plants in the Northern Cape Province. ▪ Public Participation as part of the EIA for the proposed Delareyille Kopela Power Line and Substation, North West Province. Public Participation as part of the EIA for the Middelburg Water Reclamation Project, Mpumalanga Province.
Environmental Consultant	SiVEST (Pty) Ltd – Lynsey Rimbault
Contact Details	lynseyr@sivest.co.za
Qualifications	BA Geography and English, BSc (Hons) Geography, and MSc Biodiversity, Conservation and Management
Expertise to carry out the EMPr	Lynsey has 2.5 years' work experience and holds the position of Environmental Consultant. She is specialising in the management and compilation of Environmental Impact Assessments (EIAs) and Basic Assessment (BAs) primarily related to energy generation and electrical distribution projects. **Environmental Impact Assessments and Basic Assessments:** ▪ EIA for the Proposed Construction of Two Power Lines, a Linking Station and Two Substations for the Mainstream Renewable Power Wind Farms, Near Beaufort West in the Western Cape Province.

	▪ EIAs for the 3 X Sendawo 75MW Solar Photovoltaic (PV) Energy Facilities near Vryburg, North West Province. ▪ EIAs for the 2 X Tlisitseng 75MW Solar Photovoltaic (PV) Energy Facilities near Lichtenburg, North West Province. ▪ EIAs for the 3 X Helena 75MW Solar Photovoltaic (PV) Energy Facilities near Copperton, Northern Cape Province. ▪ BA for the Ermelo-Richards Bay Coal Line Upgrade Project: Proposed development of the Madlanzini Main Transmission Station and Associated 88kV and 400kV turn in power lines, Mpumalanga Province. ▪ EIA for the proposed development of the Dwarsrug Wind Farm near Loeriesfontein, Northern Cape Province. ▪ BA for the proposed Construction of the Mookodi Integration Phase 2 132kV Power Line from the Mookodi MTS to the new proposed Ganyesa Substation, North West Province. ▪ EIA for the proposed construction of the Nokukhanya Solar Photovoltaic Power Plant near Dennilton, Limpopo Province.

Please refer to attached CV's for more information in Appendix 2. Declarations of independence of each specialist are contained in Appendix 3.

1.6 Final Scoping Report Structure

This Final Scoping Report (FSR) is structured as follows:

- Chapter 1 introduces the project and explains the objectives of the Scoping phase. The chapter also outlines the relevance of the Equator Principles as well as the IFC Performance Standards and points out the specialist studies for the project. It describes the authority consultation thus far. Furthermore, the chapter discusses the experience of the Environmental Assessment Practitioners (EAP), including specialists, who have contributed to the report.
- Chapter 2 presents the technical description of the project, including a description of alternatives being considered.
- Chapter 3 expands on the relevant legal ramifications applicable to the project and describes relevant development strategies and guidelines.
- Chapter 4 provides explanation to the need and desirability of the proposed project.
- Chapter 5 provides a description of the region in which the proposed development is intended to be located. Although the chapter provides a broad overview of the region, it is also specific to the application. It contains descriptions of the site and the specialist studies are also summarised.
- Chapter 6 identifies potential impacts associated with the proposed wind energy facility. The chapter further identifies these impacts per specialist study and discusses potential cumulative impacts.
- Chapter 7 discusses layout alternatives, including how they relate to sensitive areas identified by specialists and provides a preliminary comparison of alternatives.

- Chapter 8 describes the Public Participation Process (PPP) undertaken during the Scoping Phase and tables issues and concerns raised by Interested and Affected Parties (I&APs).
- Chapter 9 provides an assessment of the report in terms of the Equator Principles.
- Chapter 10 provides a conclusion to the FSR and recommendations to be addressed in further assessment.
- Chapter 11 describes the environmental impact reporting phase of the EIA (i.e. the way forward for this study and includes the Plan of Study for EIA).
- Chapter 12 lists references indicated in the FSR.

2 TECHNICAL DESCRIPTION

The proposed project will encompass the installation of a wind turbines and associated infrastructure, in order to generate electricity that is to be fed into the Eskom grid. The facility will have a maximum export capacity of 140MW. The total area of the project infrastructure has not been determined and will be determined during the EIA phase, however the total area of the application site is 11 002 hectares. During the scoping phase the entire application site has been assessed in order to inform the preliminary comparison of layout alternatives for the wind energy facility. These layout alternatives have been discussed in Chapter 7 and are presented in the Plan of Study for the EIA Phase (Chapter 11).

2.1 Project Location

The proposed development will be located approximately 20km east of Copperton, within the Siyathemba Local Municipality of the Pixley ka Seme District Municipality in the Northern Cape Province. The study area is on the following property:

- Portion 1 of Drielings Pan No.101
- Portion 2 of Drielings Pan No.101
- Portion 3 of Drielings Pan No.101
- Remainder of Drielings Pan No.101

The project site has been identified through pre-feasibility studies conducted by BioTherm based on wind resource, grid connection suitability, competition, flat topography, land availability and site access.

The proposed development location is shown in the locality map (**Figure 2**) below.

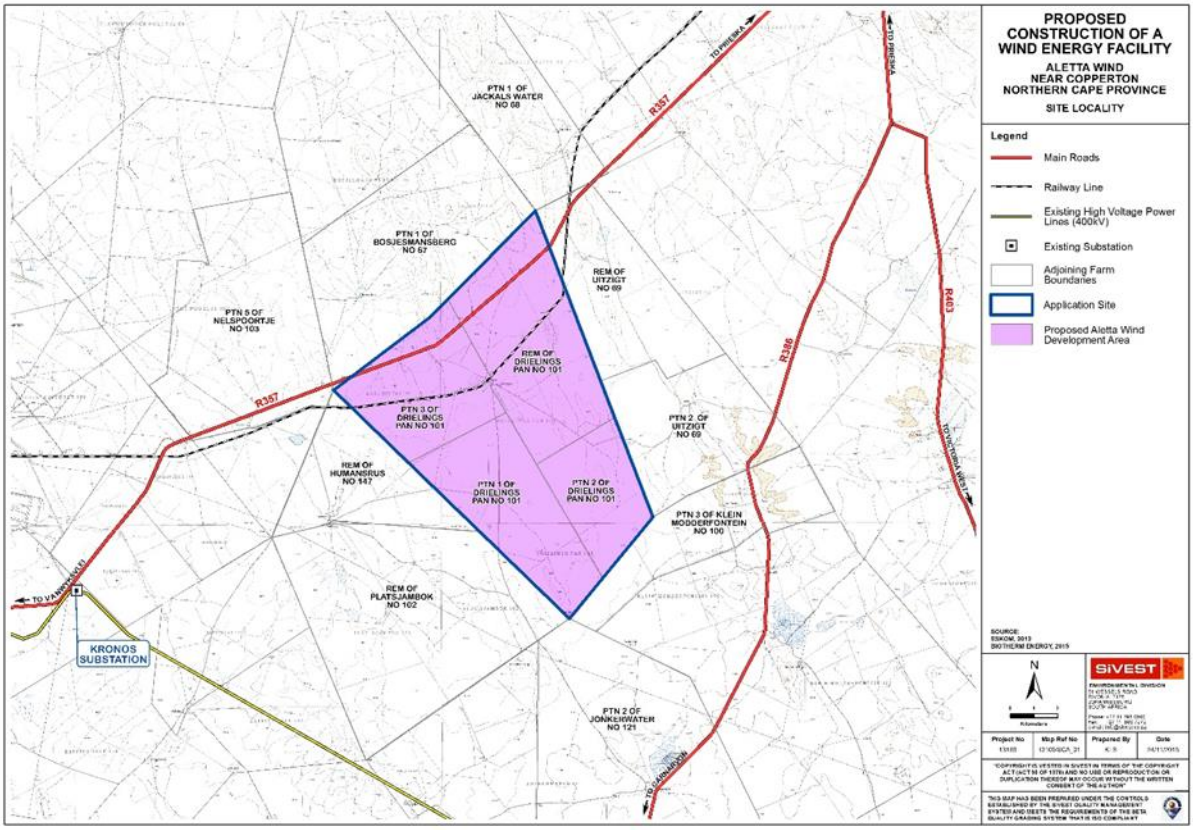


Figure 2: Proposed Aletta wind energy facility site locality map

2.2 Wind Farm Technical details

The key technical details and infrastructure required is presented in the table below (Table **5**).

Table 5: Aletta Wind Farm summary

Project Name	**DEA Reference**	**Farm name and area**	**Technical details and infrastructure necessary for the proposed project**
Aletta Wind Farm	To be announced	▪ Portion 1 of Drielings Pan No.101 ▪ Portion 2 of Drielings Pan No.101 ▪ Portion 3 of Drielings Pan No.101	▪ Up to **80 wind turbines** with a total export capacity of up to 140MW. Turbines will have a hub height of up to 120m and a rotor diameter of up to 150m. ▪ **132kV onsite Aletta IPP Substation** ▪ The turbines will be connected via **medium voltage cables** to the proposed 132kV onsite Aletta IPP Substation**.** ▪ Internal **access roads** are proposed to be between 4m to 6m wide.

		▪ Remainder of Drielings Pan No.101 Development Area: 11 002 ha	▪ A temporary construction **lay down area,** which may include a batching plant**.** ▪ A **hard standing area / platform** per turbine. ▪ The **operations and maintenance buildings**, including an on-site spares storage building, a workshop and an operations building. ▪ **Fencing** (if required) will be up to 5m where required and will be either mesh or palisade.

The key components of the project are detailed below.

2.2.1 Turbines

The total amount of developable area is 11 002 hectares. The wind turbines and all other project infrastructure will be placed strategically within the development area based on environmental constraints. The size of the wind turbines will depend on the development area and the total generation capacity that can be produced as a result. The wind turbines will therefore likely have a hub height of up to 120m and a rotor diameter of up to 150m (**Figure 3**). The blade rotation direction will be clock-wise. Each wind turbine will have a foundation diameter of up to 20mand will be approximately 3m deep, however, these dimensions may be larger if geotechnical conditions dictate as such. The area occupied by each wind turbine will be up to 0.5 hectares (85m x 60m). The excavation area will be approximately 1 000m² in sandy soils due to access requirements and safe slope stability requirements. A hard standing area / platform of approximately 2 400m^2 (60m x 40m) per turbine will be required for turbine crane usage. There will be up to 80 wind turbines constructed with a total export capacity of up to 140MW. The electrical generation capacity for each turbine will range from 2 to 4MW depending on the final wind turbine selected for the proposed development. It must be noted that the final selection for the turbine type will be conducted after the project has been selected as a Preferred Bidder project under the DoE REIPPPP. This is as a result of technology constantly changing as time progresses.

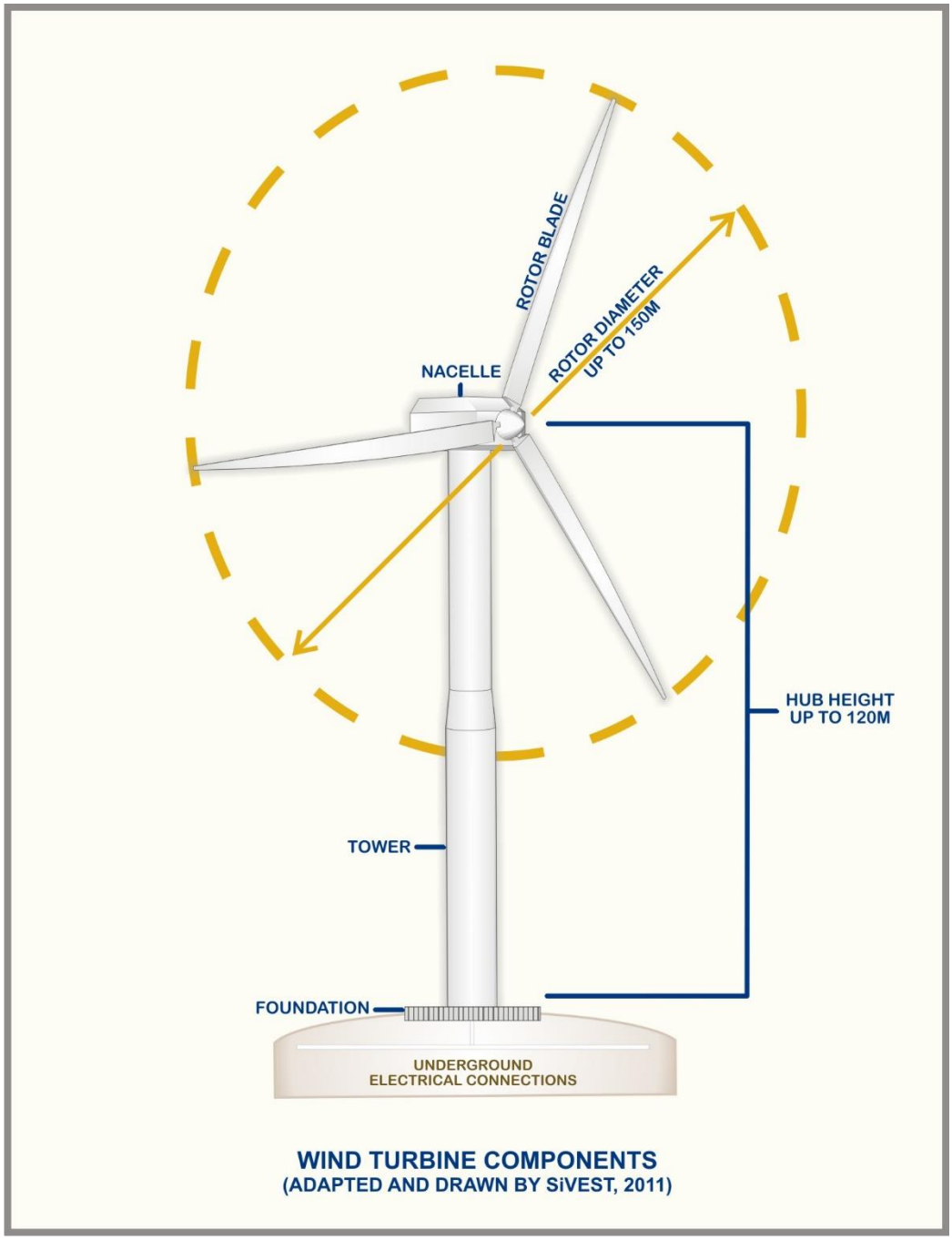


Figure 3: Typical Components of a Wind Turbine

2.2.2 Electrical Connections

The wind turbines will be connected (**Figure 4**) to the proposed onsite Aletta 132kV substation using buried (up to a 1.5m depth) medium voltage cables except where a technical assessment of the proposed design suggests that overhead lines are more appropriate such as over rivers, gullies and long runs. Where overhead power lines are to be constructed, self-supported or H-pole tower types will be used. The height will vary based on the terrain, but will ensure minimum Overhead Line (OHL)

clearances with buildings, roads and surrounding infrastructure will be maintained. The dimensions of the specific OHL structure types will depend on electricity safety requirements. The exact location of the towers, the selection of the final OHL structure types and the final designs will comply with the best practise and SANS requirements.

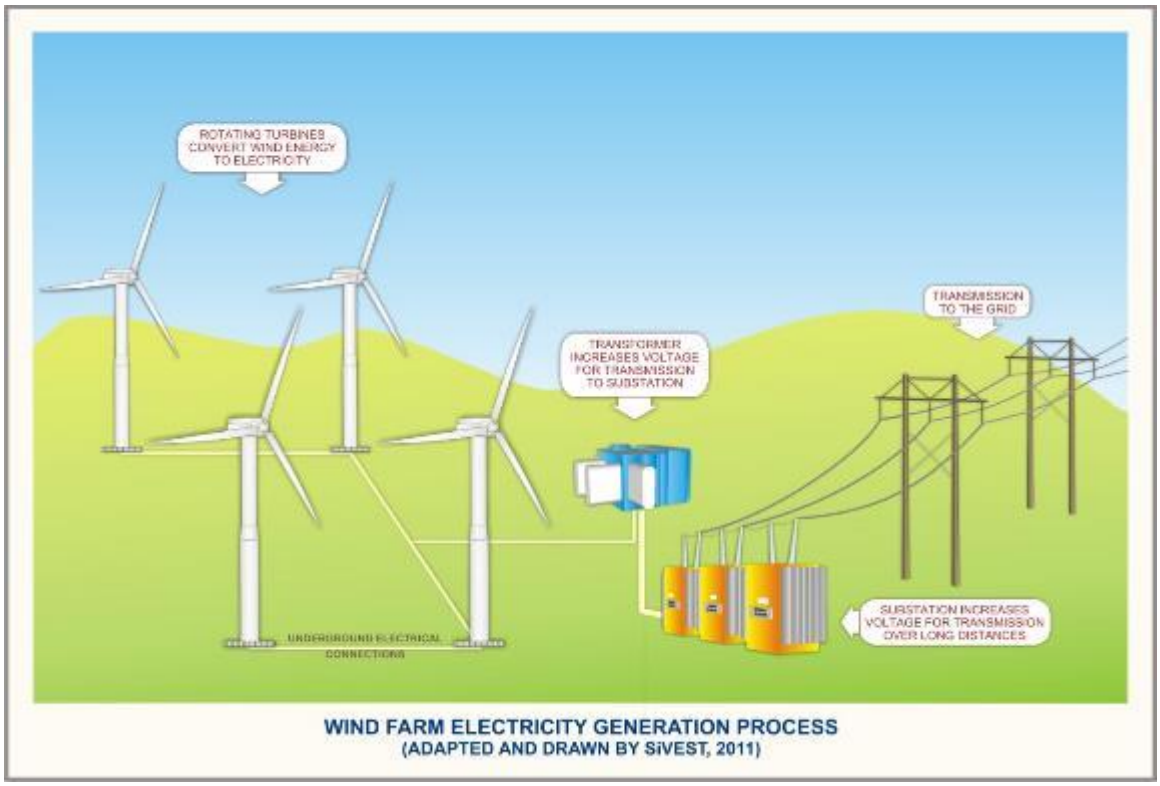


Figure 4: Conceptual Wind Farm Electricity Generation Process showing Electrical Connections

2.2.3 Roads

The internal access roads are proposed to be between 4m to 6m wide and approximately 60kmin total. This will include the net load carrying surface excluding any V drains that might be required. Double width roads will be required in strategic places for vehicle passing or turning.

2.2.4 Temporary Construction Area

The temporary construction lay down area will be approximately 2 400m² (60m x 40m). The lay-down / staging area will be approximately 11 250m² whilst the lay-down area for concrete towers (only if required) will be approximately 40 000m².

2.2.5 Operation and Maintenance Buildings

The operation and maintenance buildings will include an on-site spares storage building, a workshop and operations building with a total combined footprint that will not exceed 300m². The operation and

maintenance buildings will be situated in proximity to the wind farm substation due to requirements for power, water and access.

2.2.6 Other Associated Infrastructure

Other infrastructure includes the following:

- Fencing (if required) will be up to 5m where required and will be either mesh or palisade.

2.3 Alternatives

As per Chapter 1 of the EIA regulations (2014), feasible and reasonable alternatives are required to be considered during the EIA process. Alternatives are defined as "different means of meeting the general purpose and requirements of the activity". These alternatives may include:

(a) The property on which or location where it is proposed to undertake the activity;
(b) The type of activity to be undertaken;
(c) The design or layout of the activity;
(d) The technology to be used in the activity;
(e) The operational aspects of the activity; and
(f) The option of not implementing the activity.

Each of this alternatives is discussed in relation to the proposed project in the sections below.

2.3.1 The property on which or location where it is proposed to undertake the activity;

Prior to the initiation of the EIA alternative properties were considered for the location of the proposed project. The selection of a potential wind project includes several key aspects including wind resource, environmental, grid connection suitability as well as competition, topography and access. This site was selected by BioTherm based on the above criteria ahead of other regional farms due to the cumulative assessment of all criteria. This internal process takes several weeks to complete and ensures that the least environmentally sensitive farm is selected in the specific region of development.

No site alternatives for this project are being considered during the EIA. The placement of wind energy installations is dependent on several factors, all of which are favourable at the proposed site location. These include wind resource, land availability, climate, topography, grid connections and access to the site. The project site has been identified by BioTherm through a pre-feasibility desktop analysis based on the estimation of the wind energy resource, land availability and grid connections. The project site has access to the national grid via either the existing Kronos or Cuprum Substations, or the proposed Copperton Wind or Garob IPP Substations. The Kronos substation is the technically preferred option as this is the likely point of connection that will be selected by Eskom, however the other alternatives have also been assessed. The project site has a relatively flat topography which is suitable for the development of a wind energy facility. The project site is easily accessible via the N10 national road

and the R357 from Prieska. The site is therefore considered highly suitable for the proposed development and no other locations are being considered.

2.3.2 The type of activity to be undertaken;

No other activity alternatives are being considered. Renewable energy development in South Africa is highly desirable from a social, environmental and development point of view. Wind energy installations are suitable for the site because of the high wind resource.

2.3.3 The design or layout of the activity;

Prior to the start of the EIA BioTherm intended to construct 125 turbines on the Aletta site this number of turbines provide flexibility in that turbines of 1-1.5MW can be considered, however consideration of the Square Kilometre Array (SKA) necessitated the reduction of the 125 turbines to a proposed 80 turbine layout. Although the reduction of the number of turbines equated to a reduction in capacity, this design amendment was done taking environmental considerations into account. The proposed 125 turbine layout and the amended proposed 80 turbine layout are shown in **Figure 5** and **Figure 6** below.

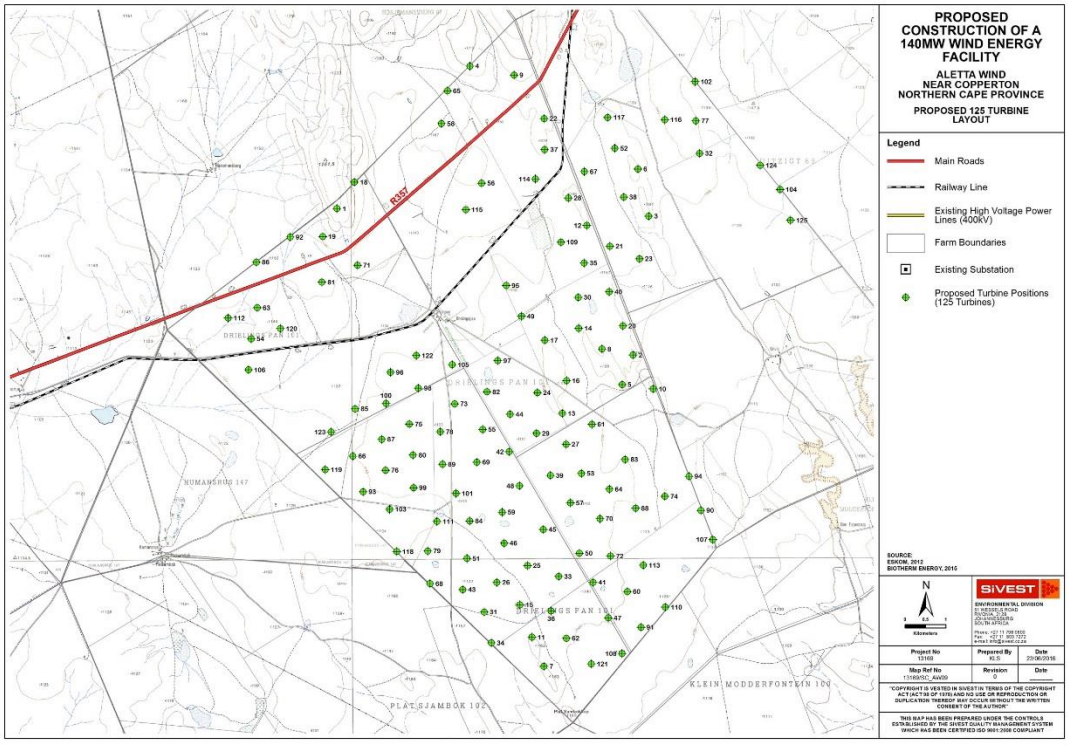


Figure 5: Proposed Aletta 125 turbine layout

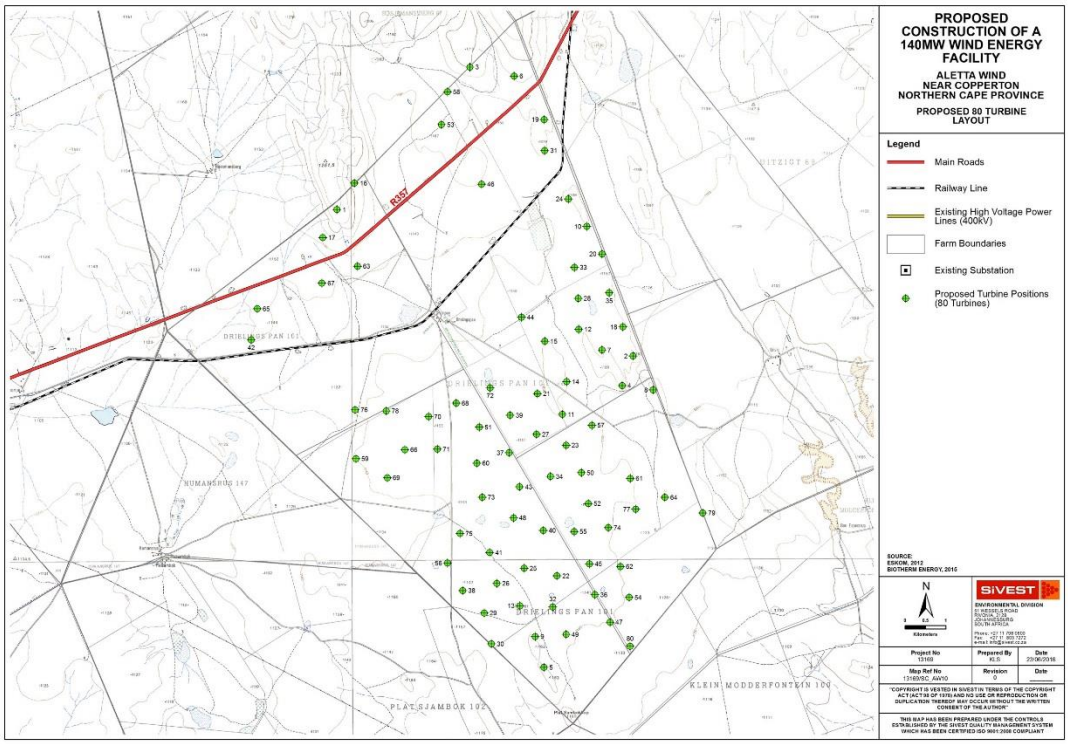


Figure 6: Proposed Aletta 80 turbine layout

Additionally, further design or layout alternatives are being considered during the EIA process. Various environmental specialists assessed the site during the scoping phase. Their assessments encompassed the entire proposed development site and included the identification of sensitive areas. These sensitive areas were used during the scoping phase to perform a preliminary comparison of layout alternatives (Chapter 7). These layouts will be extensively investigated in the EIA phase of the project (see the plan of study for the EIA phase in Chapter 11 of the FSR). The design and layout alternatives being considered include a comparative assessment of a 60 turbine layout versus an 80 turbine layout, and alternative locations for the onsite substations and O&M buildings. The assessment of the turbine layouts, substations and O&M building layout alternatives will be based on both environmental constraints and design factors. The EIA phase layout alternatives, including maps, are presented in Chapter 11.

2.3.4 The technology to be used in the activity;

The technology selected for the Aletta wind energy facility was based on environmental constraints, technical and economic considerations. The size of the wind turbines will depend on the development area and the total generation capacity that can be produced as a result. Therefore no technology alternatives will be considered during the EIA. The choice of technology used will ultimately be determined by technological and economic factors at a later stage.

2.3.5 The operational aspects of the activity; and

No operational alternatives were assessed in the EIA.

2.3.6 The option of not implementing the activity.

The option of not implementing the activity, or the **'no-go'** alternative, is considered in the EIA. South Africa is under immense pressure to provide electricity generating capacity in order to reduce the current electricity demand in the country. With the global focus on climate change, the government is under severe pressure to explore alternative energy sources in addition to coal-fired power stations. Although wind energy is not the only solution to solving the energy crisis in South Africa, not establishing the proposed wind energy facility would be detrimental to the mandate that the government has set to promote the implementation of renewable energy. It is a suitable sustainable solution to the energy crisis and this project could contribute to addressing the problem. This project will aid in achieving South Africa's goals in terms of sustainability, energy security, mitigating energy cost risks, local economic development and national job creation.

3 LEGAL REQUIREMENTS AND GUIDELINES

3.1 Key Legal and Administrative Requirements Relating to the Proposed Development

3.1.1 National Environmental Management Act No. 107 of 1998 – NEMA EIA Requirements

The National Environmental Management Act (Act No. 107 of 1998) was promulgated in 1998 but has since been amended on several occasions from this date. This Act replaces parts of the Environment Conservation Act (Act No 73 of 1989) with exception to certain parts pertaining to Integrated Environmental Management. The act intends to provide for:

- co-operative environmental governance by establishing principles for decision-making on matters affecting the environment;
- institutions that will promote co-operative governance and procedures for coordinating environmental functions exercised by organs of state;
- to provide for the prohibition, restriction or control of activities which are likely to have a detrimental effect on the environment;
- and to provide for matters connected therewith.

NEMA now governs the EIA process with the recent promulgation of the new EIA regulations in December 2014 (Government Gazette No. 38282 of 4th December 2014).

Activities that may significantly affect the environment must be considered, investigated and assessed prior to implementation.

In terms of the newly released EIA Regulations promulgated in terms of Chapter 5 NEMA (National Environmental Management Act), which came into effect on 8th December 2014, a full EIA is required for the proposed project.

3.1.2 NEMA EIA Requirements

Sections 24 and 44 of NEMA make provision for the promulgation of regulations that identify activities which may not commence without an environmental authorisation, the result being that NEMA now governs the EIA process with the said promulgation of EIA Regulations in December 2014 (Government Gazette No. 38282 of 04 December 2014). This EIA has therefore been undertaken in accordance with the NEMA EIA 2014 Regulations which are contained in four Government Notices (GN R 982, 983, 984, and 985) which came into effect on 8th December 2014.

In terms of these Regulations, a full Environmental Impact Assessment is required for the proposed development based on triggered activities. However, several activities which trigger a basic assessment were also identified and need also be specified. Ultimately, these activities will not form a separate assessment, but will fall into the greater EIA.

The following Schedules of the Government Notice No. R. 983 – 985 of the 4th December 2014 are of relevance to the project in question. All of the Listed Activities identified in terms of Sections 24(2) and 24D include:

Table 6: Listed activities in terms of the NEMA Regulations

Activity number of the relevant notice:	**Listed activity as described in GNR 983, 984 and 985**	**Description of Listed Activity**
GN R. 983 Item 11	*The development of facilities or infrastructure for the transmission and distribution of electricity-* *(i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts*	**An onsite IPP substation will be constructed as part of the wind energy facility. The proposed IPP onsite substation will be located outside an urban area and will have a capacity of 132kV.**
GN R. 983 Item 12	*The development of :* *x) buildings exceeding 100 square metres in size;* *xii) infrastructure or structures with a physical footprint of 100 square metres or more;* *where such development occurs-* *(a) within a watercourse;* *(b) in front of a development setback; or* *(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse;*	**The proposed project will entail the development of buildings and other infrastructure exceeding 100 square metres in size. The scoping phase surface water assessment revealed that there are surface water features located on the proposed site. The proximity of the proposed development footprint to watercourses will be determined during the EIA phase once final layouts have been selected and after detailed specialist studies have been undertaken.**
GN R. 983 Item 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;* *But excluding where such infilling, depositing , dredging, excavation, removal or moving-* *(a) will occur behind a development setback;* *(b) is for maintenance purposes undertaken in accordance with a maintenance management plan; or* *(c) falls within the ambit of activity 21 in this Notice, in which case that activity applies.*	**The scoping phase surface water assessment revealed that there are surface water features located on the proposed site. The proximity of the proposed development footprint to watercourses will be determined during the EIA phase once final layouts have been selected and after detailed specialist studies have been undertaken. Should construction activities take place within a watercourse soil is likely to be removed**.
GN R. 983 Item 24	*The development of-* *ii) a road with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres;*	**On site roads will be required for the proposed development. The width of these roads will be determined during the EIA phase.**
GN R. 983 Item 28	*Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for*	**The proposed project site is currently used for sheep farming, and the proposed project will result in an area**

	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;* *excluding where such land has already been developed for residential, mixed, retail, commercial, industrial or institutional purposes.*	**greater than 1 hectare being transformed into an industrial land use.**
GN R. 983 Item 56	*The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre -* *(i) where the existing reserve is wider than 13,5 meters; or* *(ii) where no reserve exists, where the existing road is wider than 8 metres –* *excluding where widening or lengthening occur inside urban areas.*	**It is likely that existing access roads will need to be upgraded in order to access the site. The required width and length of the expansion will be determined during the EIA process.**
GN R. 984 Item 1	*The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more, excluding where such development of facilities or infrastructure is for photovoltaic installations and occurs* *(a) within an urban area; or* *(b) on rooftops.";*	**It is proposed that a wind energy facility with a maximum export capacity of 140MW will be constructed.**
GN R. 984 Item 15	*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 management plan.*	**The proposed development will transform more than 20 hectares of indigenous vegetation. The area occupied by each wind turbine will be up to 0.5 hectares and there are proposed to be up to 80 turbines as well as associated infrastructure.**
GN R. 984 Item 24	*The extraction or removal of peat or peat soils, including the disturbance of vegetation or soils in anticipation of the extraction or removal of peat or peat soils, but excluding where such extraction or removal is for the rehabilitation of wetlands in accordance with a maintenance management plan.*	**The scoping phase surface water assessment revealed that there are surface water features located on the proposed site. The existence of peat soils will be confirmed after detailed specialist fieldwork during the EIA phase. The proximity of the proposed development footprint to watercourses will be determined during the EIA phase once final layouts have been selected and after detailed specialist studies have been undertaken.**

GN R. 985 Item 4	The development of a road wider than 4 metres with a reserve less than 13,5 metres. *(a) In the Northern Cape Province* *i Outside urban areas, in:* *(bb) National Protected Area Expansion Strategy Focus areas;* *(cc) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority;* *(ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;* *(gg) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from a biosphere reserve; or*	**Internal roads will be constructed and these are planned to be more than 4m wide. The proposed project is within the National Protected Area Expansion Strategy Focus areas. The proximity of the proposed project to protected areas will be determined at a later stage of the EIA, following detailed specialist studies.**
GN R. 985 Item 12	*The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan.* *(d) In the Northern Cape Province* *i. Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004;* *ii. Within critical biodiversity areas identified in bioregional plans;* *iv. On land, where, at the time of the coming into effect of this Notice or thereafter such land was zoned open space, conservation or had an equivalent zoning.*	**More than 300 square metres of vegetation would need to be cleared for the proposed wind energy facility and associated infrastructure. The nature of vegetation on site will be clarified following detailed fieldwork. The proximity of the proposed project to protected areas will be determined at a later stage of the EIA, following detailed specialist studies.**
GN R. 985 Item 14	*The development of-* *(x) buildings exceeding 10 square metres in size;* *(xii) infrastructure or structures with a physical footprint of 10 square metres or more;* *where such development occurs-*	**The turbines and associated infrastructure will exceed 10m in size. The proximity of the proposed project to surface water features and protected areas will be determined at a later stage of the EIA, following detailed specialist studies.**

	(a) within a watercourse; *(b) in front of a development setback; or* *(c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse* *(a) In the Northern Cape Province* ii *Outside urban areas, in:* *(bb) National Protected Area Expansion Strategy Focus areas;* *(dd) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority;* *(ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;* *(hh) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve;*	
GN R. 985 Item 18	*The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre.* *(a) In the Northern Cape Province* ii *Outside urban areas, in:* *(bb) National Protected Area Expansion Strategy Focus areas;* *(cc) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority;* *(ee) Critical biodiversity areas (Terrestrial Type 1 and 2) as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;* *(gg) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve; or* *(ii) Areas on the watercourse side of the development setback line or within 100*	**It is likely that existing access roads will need to be upgraded in order to access the site. The proposed project is within the National Protected Area Expansion Strategy Focus areas. The proximity of the proposed project to protected areas will be determined at a later stage of the EIA, following detailed specialist studies.**

	metres from the edge of a watercourse where no such setback line has been determined	

3.1.3 Environmental Impact Assessment Guideline for Renewable Energy Projects, DEA Notice 989 of 2015

The purpose of this document is primarily to provide guidance on the environmental management legal framework applicable to renewable energy operations and all the role players in the sector. The guideline is principally intended for use by the following stakeholder groups:

- Public Sector Authorities (as regulator and/or competent authority);
- Joint public sector authorities and project funders, e.g., Eskom, IDC, etc.
- Private Sector Entities (as project funder/developer/consultant);
- Other interested and affected parties (as determined by the project location and/or scope).

This guideline seeks to identify activities requiring authorisation prior to commencement of that activity, and provide an interface between national EIA regulations and other legislative requirements of various authorities.

The guidelines are applicable for the construction, installation and/or development of the following renewable energy projects:

- Concentrating Solar Power Plant;
- Wind Farm;
- Hydropower Station; and
- Photovoltaic Power Plant.

As the proposed development is for a wind energy facility it is subject to the recommendations proposed in the guidelines.

3.1.4 National Energy Act No. 34 of 2008

The National Energy Act (Act no, 34 of 2008), promulgated in 2008, has, as one of its key objectives, the promotion of diversity of supply of energy and its sources. From this standpoint, the Act directly references the importance of the renewable energy (RE) sector, with a mention of the wind energy sector included. The aim is to ensure that the South African economy is able to grow and develop, fast tracking poverty alleviation, through the availability of a sustainable, diverse energy mix. Moreover, the goal is to provide for the increased generation and consumption of RE (Republic of South Africa, 2008).

3.1.5 National Heritage Resources Act No. 25 of 1999

This Act requires all developers to undertake archaeological impact studies whenever any type of development activity is undertaken. Preliminary archaeological impact studies will consequently

become a common procedure for all development activities, even if such development may be exempted in terms of the National Environmental Management Act (Act No 107 of 1998).

The law ensures community participation in the protection of national heritage resources and will involve all three levels of government in the management of the country's national heritage. The South African Heritage Resources Agency (SAHRA) will establish and maintain a national policy, strategy plans and standards for heritage resources management and will monitor the system as a whole.

Heritage authorities will assist and co-operate with individuals and organisations concerned with the study, the conservation, promotion and utilisation of national heritage resources. A newly established National Heritage Resources Fund will provide financial assistance for heritage projects.

A heritage assessment has been conducted to explore how the proposed development may impact on heritage resources as protected by the Act.

3.1.6 National Water Act No. 36 of 1998, as amended

The National Water Act (NWA) No 36 of 1998 was promulgated on the 20th August 1998. This Act is important in that it provides a framework to protect water resources against over exploitation and to ensure that there is water for socio-economic and economic development, human needs and to meet the needs of the aquatic environment. The Act also recognises that water belongs to the whole nation for the benefit of all people.

It is important to note that water resources are protected under the Act. Under the act, water resources as defined include a watercourse, surface water, estuary or aquifer. A watercourse is defined as a river or spring, a natural channel in which water flows regularly or intermittently, or a wetland, lake or dam into which, or from which water flows.

One of the main aims of the Act is the protection of water resources. 'Protection' in relation to a water resource entails:

- Maintenance of the quality of the water resource to the extent that the water use may be used in a sustainable way;
- Prevention of degradation of the water resource; and
- The rehabilitation of the water resource.

In the context of the proposed development and any potential impact on water resources, the definition of pollution and pollution prevention contained within the Act is relevant. 'Pollution', as described by the Act is the direct or indirect alteration of the physical, chemical or biological properties of a water resource, so as to make it (*inter alia*):

- less fit for any beneficial purpose for which it may reasonably be expected to be used; or
- harmful or potentially harmful to the welfare or human beings, to any aquatic or non-aquatic organisms, or to the resource quality.

This definition of pollution is quite wide ranging, and it applies to all types of water resource. Activities which cause alteration of the biological properties of a watercourse (i.e. the fauna and flora contained within that watercourse are also considered pollution).

In terms of section 19 of the Act owners / managers / people occupying land on which any activity or process undertaken which causes, or is likely to cause pollution of a water resource must take all reasonable measures to prevent any such pollution from occurring, continuing or recurring. These measures may include (inter alia):

- measures to cease, modify, or control any act or process causing the pollution;
- comply with any prescribed waste standard or management practice;
- contain or prevent the movement of pollutants;
- remedy the effects of the pollution; and
- remedy the effects of any disturbance to the bed and banks of a watercourse.

A surface water assessment has been conducted to explore how the proposed development may impact on water resources as protected by the Act.

3.1.7 National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004 as amended)

The overarching aim of the National Environmental Management: Biodiversity Act (NEMBA) No. 10 of 2004, within the framework of NEMA, is to provide for:

- The management and conservation of biological diversity within South Africa, and of the components of such biological diversity;
- The use of indigenous biological resources in a sustainable manner; and
- The fair and equitable sharing among stakeholders of benefits arising from bio-prospecting involving indigenous biological resources.

The South African National Biodiversity Institute (SANBI) was established by the NEMBA, its purpose being (*inter alia*) to report on the status of the country's biodiversity and the conservation status of all listed threatened or protected species and ecosystems.

NEMBA provides for a range of measures to protect ecosystems and for the protection of species that are threatened or in need of protection to ensure their survival in the wild, including a prohibition on carrying out a "restricted activity" involving a specimen of a listed threatened or protected species without a permit issued in terms of Chapter 7. Lists of critically endangered, endangered, vulnerable and protected species have been published and a permit system for listed species has been established.

It is also appropriate to undertake a Biodiversity Impact Assessment where proposed developments, in an area that is considered ecologically sensitive, require an environmental authorisation in terms of

NEMA, with such Assessment taking place during the basic assessment or EIA. This study will be undertaken during the project.

The NEMBA is relevant to the proposed project as the construction of the wind energy facility and other components (such as the substation) may impact negatively on biodiversity. The project proponent is therefore required to take appropriate reasonable measures to limit the impacts on biodiversity, to obtain permits if required and to also invite SANBI to provide commentary on any documentation resulting from the proposed development.

3.1.8 National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003 as amended)

The overarching aim of the National Environmental Management: Protected Areas Act (NEMPAA) No. 57 of 2003, within the framework of NEMA, is to provide for:

- provide for the declaration and management of protected areas;
- provide for co-operative governance in the declaration and management of protected areas;
- effect a national system of protected areas in South Africa as part of a strategy to manage and conserve its biodiversity;
- provide for a representative network of protected areas on state land, private land and communal land;
- promote sustainable utilisation of protected areas for the benefit of people, in a manner that would preserve the ecological character of such areas;
- promote participation of local communities in the management of protected areas, where appropriate; and
- provide for the continued existence of South African National Parks.

3.1.9 National Forests Act, 1998 (Act No. 84 of 1998)

The National Forest Act (NFA) was enacted to:

- Provide for the protection, management and utilisation of forests;
- The protection of certain plant and animal life;
- The regulation of trade in forest produce;
- The control and management of a national hiking way system and National Botanic Gardens.

The NFA enforces the necessity for a license to be obtained prior to destroying any indigenous tree in a natural forest and, subject to certain exemptions, cutting, disturbing, damaging, destroying or removing any protected tree. The list of protected trees is currently contained in GN 908 of 21 November 2014. Licenses are issued by the Minister and are subject to periods and conditions as may be stipulated.

The NFA is relevant to the proposed project as the removal and/or disturbance and/or clearance of indigenous vegetation may be required and a license in terms of the NFA may be required for this to be done.

3.1.10 Conservation of Agricultural Resources Act No. 43 of 1983

The Conservation of Agricultural Resources Act (CARA) No. 43 of 1983 controls the utilisation of natural agricultural resources in South Africa. The Act promotes the conservation of soil, water sources and vegetation as well as the combating weeds and invader plants. The Act has been amended in part by the Abolition of Racially Based Land Measures Act, No. 108 of 1991.

The primary objective of the Act is to conserve natural agricultural resources by:

- maintaining the production potential of land;
- combating and preventing erosion and weakening or destruction of the water resources;
- protecting vegetation; and
- combating weeds and invaders plants.

The CARA is relevant to the proposed projects as the construction of a wind energy facility as well as other components (such as the substation) may impact on agricultural resources and vegetation on the site. The Act prohibits the spreading of weeds and prescribes control measures that need to be complied with in order to achieve this. As such, measures will need to be taken to protect agricultural resources and prevent weeds and exotic plants from invading the site as a result of the proposed development.

An agricultural potential assessment has been conducted to explore how the proposed development may impact on the agricultural production potential of the proposed site.

3.1.11 Subdivision of Agricultural Land Act No. 70 of 1970, as amended

The Subdivision of Agricultural Land Act No. 70 of 1970 controls the subdivision of all agricultural land in South Africa; prohibiting certain actions pertaining to agricultural land. Under the Act the owner of agricultural land is required to obtain consent from the Minister of Agriculture in order to subdivide agricultural land.

The purpose of the Act is to prevent uneconomic farming units from being created and degradation of prime agricultural land. To achieve this purpose the act also regulates leasing and selling of agricultural land as well as registration of servitudes.

The Act is of relevance to the proposed development as any land within the study area that is zoned for agricultural purposes will be regulated by this Act.

Although the whole of this Act has been repealed by section 1 of the Subdivision of Agricultural Land Act Repeal Act 64 of 1998, this Repeal Act has not been implemented and no date of coming into operation has been proclaimed.

It is important to note that the implementation of this act is problematic as the Act defines 'Agricultural Land' as being any land, except land situated in the area of jurisdiction of a municipality or town council, and subsequent to the promulgation of this Act uninterrupted Municipalities have been established throughout South Africa.

3.1.12 National Road Traffic Act No. 93 of 1996, as amended

The National Road Traffic Act (NRTA) No. 93 of 1996 provides for all road traffic matters and is applied uniformly throughout South Africa. The Act enforces the necessity of registering and licensing motor vehicles. It also stipulates requirements regarding fitness of drivers and vehicles as well as making provision for the transportation of dangerous goods.

All the requirements stipulated in the NRTA will need to be complied with during the construction and operational phases of the proposed wind energy facility. The contractor will also need to obtain the necessary road and transportation permits from the Northern Cape Provinicial Department of Roads and Transport.

A traffic assessment has been conducted to explore how the proposed development may impact on local traffic, long distance routes and local communities.

3.1.13 Civil Aviation Act No. 13 of 2009

The Civil Aviation Act No. 13 of 2009 controls and regulates aviation within South Africa. It provides for the establishment of a South African Civil Aviation Authority and independent Aviation Safety Investigation Board in compliance with Annexure 13 of the Chicago Convention. It gives effect to various conventions related to aircraft offences, civil aviation safety and security, and provides for additional measures directed at more effective control of the safety and security of aircrafts, airports and matters connected thereto.

Although the Act is not directly relevant to the proposed development, it should be considered as the establishment of a photovoltaic energy facility may impact on aviation and air traffic safety if located directly within aircraft flight paths.

ATNS (Air Traffic and Navigation Services Company Limited) and the Civil Aviation Authority will be consulted and the required approvals will be obtained.

3.1.14 Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009)

These are developed to protect both animal and plant species within the various provinces of the country which warrant protection. These may be species which are under threat or which are already considered to be endangered. The provincial environmental authorities are responsible for the issuing of permits in terms of this legislation. The Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009) and the Nature and Environmental Conservation Ordinance 19 of 1974 are of relevance to the Northern Cape Province.

A biodiversity assessment has been conducted to explore how the proposed development may impact on biodiversity as protected by the Act.

3.1.15 Astronomy Geographic Advantage Act No. 21 of 2007

The Astronomy Geographic Advantage Act No. 21 of 2007 provides for:

- The preservation and protection of areas that are uniquely suited for optical and radio astronomy;
- Intergovernmental cooperation and public consultation on matters concerning nationally significant astronomy advantage areas and matters connected therewith.

In terms of section 7(1) and 7(2) of this Act, the Minister declared core astronomy advantage areas on 20 August 2010 under Regulation No. 723 of Government Notice No. 33462. As such, all land within a 3 Kilometre radius of the centre of the Southern African large Telescope (SALT) dome located in the Northern Cape Province, falls under the Sutherland Core Astronomy Advantage Area. The declaration also applies to the core astronomy advantage area containing the MeerKAT radio telescope and the core of the planned Square Kilometre Array (SKA) radio telescope.

Under Section 22(1) of the Act the Minister has the authority to protect the radio frequency spectrum for astronomy observations within a core or central astronomy advantage area. As such, the Minister may still under section 23(1) of the Act, declare that no person may undertake certain activities within a core or central astronomy advantage area. These activities include the construction, expansion or operation; of any fixed radio frequency interference source, facilities for the generation, transmission or distribution of electricity, or any activity capable of causing radio frequency interference or which may detrimentally influence the astronomy and scientific endeavours.

BioTherm initially appointed MESA to conduct a Topographical Analysis Assessment for Aletta wind energy facility in order to determine whether the planned wind facility development could have any influence on the SKA.

BioTherm then appointed ITC to conduct a Path Loss and Risk Assessment based on the 80 turbine layout. This risk assessment was based from measurements taken at the Gouda Windfarm. This initial high level risk assessment was conducted to enable one to estimate the maximum permissible radiated emissions from the equipment installed within the Aletta wind energy facility, compared to known radiated emission data from the Acciona AW125/3000 Wind Turbine Generator (WTG). Acciona

AW125/3000 WTG is a large turbine type and was used to show the typical impacts of a similar technology and sized turbine. The report concluded that based on the current SKA location information, a first order impact analysis shows a possible interference scenario between the Aletta wind energy facility and the nearest SKA installation at 21.43km separation distance. In order to negate the risk to an acceptable level, all equipment to be installed on site must comply with levels of 10 to 20dB below the EN 55022 Class B limit as the primary mitigation measure. Where equipment exceeds this threshold, additional shielding and filtering should be implemented to reduce the electromagnetic emissions from the windfarm. Shielding and filtering solutions are available to ensure installed plant equipment emissions remain within SKA risk tolerances. The results of the assessment do however show that required levels of 10 to 20 dB below the CISPR 22 Class B limit should be achievable.

The full Topographical Analysis Assessment and the Path Loss and Risk Assessment Report was sent to the SKA. SKA stated that as it stands the facility posed a high risk to the SKA and that a detailed emission measurements campaign must be conducted and an Emissions Control Plan, which provides sufficient evidence and proof of the mitigation required and that it is technically achievable must be compiled.

BioTherm have appointed ITC to conduct a detailed Path Loss and Risk Assessment including an Emissions Control Plan (ECP) to address the mitigation actions required to reduce the radiation emissions of the wind turbine generator levels to levels acceptable for installation within the Karoo Central Astronomy Advantage Area. ITC previously worked on the Copperton and Garob Wind Energy Facilities of which were selected as Preferred Bidders under Round 4.5 of the REIPPP program. Both these Wind Energy Facilities are adjacent to the proposed Aletta Wind Energy Facility.

In addition to the above, as discussed in section 7, BioTherm moved the turbines 25km from the nearest phase 2 SKA station and further reduced the number of turbines to 60 as this layout is proposed to be further assessed during the EIA phase.

The SKA were also provided with the opportunity to comment on the DSR and on both the initial and more detailed ITC reports including the ECP (refer to proof in Appendix 7I). Initial correspondence with the SKA is included in the Comments and Response Report (C&RR) which is included in Appendix 7E and the letter received from the SKA is included in Appendix 7D. Once further comments are received from the SKA, they will be sent to the DEA and included in the Draft and Final Environmental Impact Assessment Reports. The Topographical Analysis Assessment and bothPath Loss and Risk Assessment Reports are included in Appendix 8C.

3.1.16 Additional Relevant Legislation

- Occupational Health and Safety Act No. 85 of 1993
- National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004)
- National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008 as amended)
- Development Facilitation (Act No. 67 of 1995)
- The Hazardous Substances Act (Act No. 15 of 1973)
- Water Services Act (Act No. 108 of 1998)

- Electricity Regulation Act (Act No. 4 of 2006 as amended)
- Municipal Systems Act (Act No. 32 of 2000)
- Mineral and Petroleum Resource Development Act (Act No. 28 of 2002 as amended)
- Northern Cape Planning and Development Act, 1998 (Act No. 7 of 1998)

3.2 Key Development Strategies and Guidelines

3.2.1 Integrated Development Plans

An Integrated Development Plan (IDP) is defined in the Local Government: Municipal Systems Act No. 32 of 2000), as an inclusive and strategic plan that:

- Links, integrates and co-ordinates plans and takes into account proposals for the development of the municipality;
- Aligns the resources and capacity of the municipality with the implementation of the plan
- Forms the policy framework on which annual budgets must be based; and
- Is compatible with national and provincial development plans and planning requirements binding on the municipality in terms of legislation.

The main purpose of the IDP is considered the enhancement of service delivery and fighting poverty through an integrated and aligned approach between different role-players and stakeholders.

Each municipality is required to produce an IDP which would address pertinent issues relevant to their municipality. However, common concerns include municipal transformation and development, and service delivery and infrastructural development.

The proposed wind energy facility falls within the Siyathemba Local Municipality (LM), which is located within the greater Pixley ka Seme District Municipality (DM). The Siyathemba LM IDP for 2014/2015 identified alternative energy development as an anchor economic activity, and highlighted renewable energy development as an opportunity for the municipality. Additionally, energy has been identified as a priority growth sector. The Pixley ka Seme DM IDP for 2013/2014 references the National Development Plan's proposal to procure about 20,000MW of renewable electricity by 2030. The IDP also identifies the need for the attraction and retention of investors, which can largely be through the development of renewable energy projects.

It is therefore evident that the proposed development is aligned with the goals of the municipal IDPs in the study area.

3.2.2 Draft Integrated Energy Plan for the Republic of South Africa, 2013

The Draft Integrated Energy Plan (IEP), developed by the DoE, was undertaken to determine the best way to meet current and future energy service needs in the most efficient and socially beneficial manner, while:

- Maintaining control over economic costs;
- Serving national imperatives such as job creation and poverty alleviation; and
- Minimising the adverse impacts of the energy sector on the environment.

The IEP takes into consideration the crucial role that energy plays in the entire economy and is informed by the output of analyses founded on a solid fact base. It is a multi-faceted, long-term energy framework which has multiple objectives, some of which include:

- To guide the development of energy policies and, where relevant, set the framework for regulations in the energy sector;
- To guide the selection of appropriate technologies to meet energy demand (i.e. the types and sizes of new power plants and refineries to be built and the prices that should be charged for fuels);
- To guide investment in and the development of energy infrastructure in South Africa; and
- To propose alternative energy strategies which are informed by testing the potential impacts of various factors such as proposed policies, introduction of new technologies, and effects of exogenous macro-economic factors.

3.2.3 Integrated Resource Plan, 2010 and updated 2013

The Integrated Resource Plan (IRP) was created in order to plan for projected national electricity demand. Whilst the medium-term power generation mix will continue to lean heavily on the use of fossil fuels, the Revised Balanced Scenario (RBS) of the 2010 Integrated Resource Plan (IRP) includes for a total additional supply capacity of 17.8GWh from renewable sources by 2030. It recommends continuing with the current renewable bid programme with additional annual rounds (of 1000 MW PV capacity; 1000 MW wind capacity and 200 MW CSP capacity), with the potential for hydro at competitive rates.

3.2.4 Department of Energy White Paper on Renewable Energy, 2003

The Department of Energy (DoE) gazetted its White Paper on Renewable Energy in 2003, and introduced it as a "policy that envisages a range of measures to bring about integration of renewable energies into the mainstream energy economy." At that time the national target was fixed at 10 000GWh (0.8Mtoe) renewable energy contribution to final energy consumption by 2013. The White Paper proposed that this would be produced mainly from biomass, wind, solar and small-scale hydropower. It went on to recommend that this renewable energy should to be utilised for power generation and non-electric technologies such as solar water heating and bio-fuels. Since the White Paper was gazetted, South Africa's primary and secondary energy requirements have remained heavily fossil-fuel dependant, both in terms of indigenous coal production and use, as well as the use of imported oil resources. Alongside this, the projected electricity demand of the country has led the National utility

Eskom, to embark upon an intensive build programme to secure South Africa's longer-term energy needs, together with an adequate reserve margin.

3.2.5 Independent Power Producer Process

(The following information was extracted from the Eskom website: Guide to Independent Power Producer (IPP) processes in South Africa and Eskom**,** June 2010 http://www.eskom.co.za/live/content.php?Item_ID=14324)

The objective of this section is to provide an overview of the processes in the country and within Eskom relating to Independent Power Producers (IPPs). It is important that certain enabling policies, rules and regulations are in place to provide certainty and transparency in the introduction of IPPs.

- Country Process

South Africa has two acts that direct the planning and development of the country's electricity sector:

i. The National Energy Act of 2008 (No. 34 of 2008)
ii. The Electricity Regulation Act (ERA) of 2006 (No. 4 of 2006).

In August 2009, the Department of Energy (DoE) gazetted the Electricity Regulations on New Generation Capacity under the ERA. The New Generation Regulations establish rules and guidelines that are applicable to the undertaking of an IPP Bid Programme and the procurement of an IPP for new generation capacity. They also facilitate the fair treatment and non-discrimination between IPPs and the buyer of the energy.

- Formal Programmes

In terms of the New Generation Regulations, the Integrated Resource Plan (IRP) developed by the DoE sets out the new generation capacity requirement per technology, taking energy efficiency and the demand-side management projects into account. This required, new generation capacity must be met through the technologies and projects listed in the IRP and all IPP procurement programmes will be executed in accordance with the specified capacities and technologies listed in the IRP. The table below highlights the energy plan that has been proposed until 2030.

Table 7: Government Energy Plans up until 2030 in terms of the IRP

New Build Options								
	Coal	**Nuclear**	**Import Hydro**	**Gas - CCGT**	**Peak - OCGT**	**Wind**	**CSP**	**Solar PV**
2010	0	0	0	0	0	0	0	0
2011	0	0	0	0	0	0	0	0
2012	0	0	0	0	0	0	0	300
2013	0	0	0	0	0	0	0	300
2014	500	0	0	0	0	400	0	300
2015	500	0	0	0	0	400	0	300
2016	0	0	0	0	0	400	100	300
2017	0	0	0	0	0	400	100	300

2018	0	0	0	0	0	400	100	300
2019	250	0	0	237	0	400	100	300
2020	250	0	0	237	0	400	100	300
2021	250	0	0	237	0	400	100	300
2022	250	0	1143	0	805	400	100	300
2023	250	1600	1183	0	805	400	100	300
2024	250	1600	283	0	0	800	100	300
2025	250	1600	0	0	805	1600	100	1000
2026	1000	1600	0	0	0	400	0	500
2027	250	0	0	0	0	1600	0	500
2028	1000	1600	0	474	690	0	0	500
2029	250	1600	0	237	805	0	0	1000
2030	1000	0	0	948	0	0	0	1000
	6250	**9600**	**2609**	**2370**	**3910**	**8400**	**1000**	**8400**

A decision that additional capacity be provided by an IPP must be made with the concurrence of the Minister of Finance. Once such a decision is made, a procurement process needs to be embarked upon to procure that capacity in a fair, equitable and transparent process.

The New Generation Regulations set out the procurement process. The stages within a bid programme are prescribed as follows:

i. Request for Qualifications (RFQ)
ii. Request for Proposals (RFP)
iii. Negotiation with the preferred bidder(s).

A successful bidder will be awarded a Power Purchase Agreement (PPA) subject to approval by the Regulator.

3.2.6 The Northern Cape Provincial Growth and Development Strategy (NC PGDS)

The importance of developing the renewable energy sector in the Northern Cape was first acknowledged in the Northern Cape Provincial Growth and Development Strategy (NC PGDS). The NCnPGDS makes reference to the need to ensure availability of affordable energy. It notes, “in order to promote economic growth in the Northern Cape the availability of electricity to key industrial users at critical localities at rates that enhance the competitiveness of their industries must be ensured.” At the same time, the development of new sources of energy through the promotion of the adoption of energy applications that display a synergy with the province’s natural resource endowments must be encouraged. In this regard the NC PGDS notes that, “development of energy sources such as solar energy, the natural gas fields, bio-fuels, etc., could be some of the means by which economic opportunity and activity is generated in the Northern Cape”. The NC PGDS also notes that “sustainable utilisation of the natural resource base on which agriculture depends is critical in the Northern Cape with its fragile eco-systems and vulnerability to climatic variation”. In this regard, care needs to be taken to ensure that renewable energy facilities do not impact negatively on the region’s natural environment.

3.2.7 The Northern Cape Provincial Spatial Development Framework (SDF)

In the Northern Cape Provincial Spatial Development Framework (SDF) of 2011, the Northern Cape provincial government acknowledges that the major energy challenge faced by the province is finding a balance between ensuring electricity security and addressing issues around climate change. The Northern Cape Provincial SDF (2011) states that the energy sector could benefit the economy significantly through created economic spin-offs or multiplier effects. This will, however, require innovative planning to provide the necessary infrastructure and associated amenities to accommodate the industry in an efficient manner (Dennis Moss Partnership, 2012).

4 PROJECT NEED AND DESIRABILITY

4.1 National Renewable Energy Requirement

In 2010 South Africa (SA) had 44,157MW of power generation capacity installed. Current forecasts indicate that by 2025, the expected growth in demand will require the current installed power generation capacity to be almost doubled to approximately 74,000MW (SAWEA: 2010).

This growing demand, fuelled by increasing economic growth and social development within Southern Africa, is placing increasing pressure on South Africa's existing power generation capacity. Coupled with this, is the growing awareness of environmental impact, climate change and the need for sustainable development. Despite the worldwide concern regarding GHG emissions and climate change, South Africa continues to rely heavily on coal as its primary source of energy, while most of the countries renewable energy resources remain largely untapped (DME, 2003). There is therefore an increasing need to establish a new source of generating power in SA within the next decade.

The use of renewable energy technologies, as one of a mix of technologies needed to meet future energy consumption requirements is being investigated as part of Eskom's long-term strategic planning and research process. It must be remembered that wind energy is plentiful, renewable, widely distributed, clean and reduces greenhouse gas emissions when it displaces fossil-fuel derived from electricity. In this light, renewable wind energy can be seen as desirable.

The REIPPP programme and the competitiveness nature of the bidding process has resulted in significant lowering of solar and wind tariff prices since 2011. Solar PV, for example, was bid with tariffs of R2.80/kWh at the inception of the REIPPPP in 2011, to 60c/kWh at present. Further projects will increase the competitive nature of the REIPPP program and further result in cost savings to South African consumers.

4.2 National Renewable Energy Commitment

In support of the need to find solutions for the current electricity shortages, the increasing demand for energy, as well as the need to find more sustainable and environmentally friendly energy resources, South Africa has embarked on an infrastructure growth programme supported by various government initiatives. These include the National Development Plan (NDP), the Presidential Infrastructure Coordinating Commission (PICC), the Department of Energy's Integrated Resource Plan, the National Strategy for Sustainable Development, the National Climate Change Response White Paper, the Presidency of the Republic of South Africa's Medium-Term Framework, and the National Treasury's Carbon Tax Policy Paper.

The Government's commitment to growing the renewable energy industry in South Africa is also supported by the *White Paper on Renewable Energy* (2003) which sets out the Government's principals,

goals and objectives for promoting and implementing renewable energy in South Africa. In order to achieve the long term goal of achieving a sustainable renewable energy industry, the Department of Energy has set a target of contributing 17,8*GW* of renewable energy to the final energy consumption by 2030. This target is to be produced mainly through, wind and solar; but also through biomass and small scale hydro (DME, 2003; IRP, 2010).

4.3 Wind Power Potential in South Africa and Internationally

Onshore wind energy technology is the most commonly used and commercially developed renewable energy technology in South Africa, wind is abundant and inexhaustible (DEA Guideline for Renewable Energy, 2015). Wind energy is one of the lowest-priced renewable energy sources and is economically competitive (www.wasaproject.info).

4.4 Site Specific Suitability

The selection of a potential wind project include several key aspects including wind resource, grid connection suitability as well as environmental, competition, topography and access.

Wind resource is one of the main drivers of project viability across South Africa. This specific project site has been identified by BioTherm through a pre-feasibility desktop analysis based on the estimation of the wind energy resource. This region of the Northern Cape Province in South Africa has above average wind resource potentials. The project site receives an annual mean wind resource of approximately 7.5 m/s, there by suitable for the development of a wind farm. This high resource ensures the best value for money is gained for the economy of South Africa. The general area would experience a similar resource, but as resource is only one driver of site selection, the other aspects should be considered when holistically evaluating a project.

Grid connection suitability is the next element which drives the project location. Long connection lines have increased environmental impacts as well as add increased costs to the project development. The Aletta project site has good grid connection potential as the project is likely to connect to the existing regional Kronos Substation, the Aletta facility is located approximately 14 km from the substation, thereby minimising the need for an extensive grid network upgrade or long power line.

Environmental is a key aspect that BioTherm considers when evaluating a wind project. The project should be developed in a sustainable and ecologically friendly manner ensuring its development has the least possible impact on the land on which it will be built. The regional farms have been evaluated before the selection of these specific farms and it was concluded that the development on these farms would result in the least impact of regional fauna and flora. Certain farms in the region, which are located in the lower areas have increased biodiversity which are deemed sensitive and other farms show increased biodiversity.

The final key criteria which refines the site selection on a micro level include competition, topography and access. The project site has a flat arid topography which is suitable for the development of a wind project. The region does have several ongoing EIA developments, however only two 140MW projects have been selected preferred bidder in the region. The project site can be accessed easily via the tarred R357 regional road. Upgrade of the district gravel road will be done by the current preferred bidder projects to allow for direct access to site.

The proposed wind energy facility is situated on the Portions 1, 2, 3, and the Remainder of the Farm Drielings Pan No.101. The farm is used for commercial sheep farming. The proposed project is not envisioned to impact farming activities after the construction phase had been completed. The site is therefore considered to be suitable from a land use perspective.

4.5 Local Need

The Northern Cape Province faces numerous socio-economic and developmental challenges, which are not unique to the Province and are observed throughout the country. Reducing poverty through social development and achieving a sustainable economic growth in the Province through diversification and transformation of its economy are at the forefront of the provincial government's developmental objectives (Northern Cape Government, 2008; Office of the Premier of the Northern Cape, 2012).

The Northern Cape Province is endowed with biological diversity, mineral resources, and renewable energy sources such as solar and wind. Therefore, the achievement of its developmental objectives is envisaged to be done by capitalising on the local resources and specifically, the development of the agriculture and agro-processing, mineral extraction and mineral beneficiation, fishing and aquaculture, manufacturing, and tourism industries (Northern Cape Government, 2008; Office of the Premier of the Northern Cape, 2012).

Ensuring availability of inexpensive energy is seen to be fundamental to growing competitive industries in the Province (Northern Cape Government, 2008). However, provincial government advocates the development of the energy sector in the Province through "the promotion of the adoption of energy applications that display a synergy with the province's natural resource endowments" (Northern Cape Government, 2008). This implies the use of renewable energy sources and natural gas fields that the Province enjoys (Northern Cape Government, 2008). Provincial strategic documents specifically promote the development of large-scale renewable energy projects, similar to the one under analysis, which among others, would contribute to renewable energy targets set by national government and allow to secure supply, tackle climate change and address the needs of the Province (Office of the Premier of the Northern Cape, 2012).

Harnessing renewables is also seen to contribute towards alleviation and reduction of poverty in the Province. One of the interventions that underpins the provincial approach to poverty eradication is

"utilisation of natural resources in a sustainable manner", which in turn implies the transition to greater exploitation of renewables, including wind (Northern Cape Government, 2008).

Considering the above, it can be concluded that the development of the proposed project follows the provincial priorities and developmental objectives. From a spatial perspective, the project also does not appear to raise any red flags. The area where the project is proposed to be located is designated for agricultural land use. The review of the vision for the development of the agricultural sector in the Province further suggests that the area is suitable for forestry or grazing, where development of non-agricultural activities is not prohibited but should follow sustainable development principles.

Similar to the Province, the district and local municipalities where the proposed project is to be established, also face challenges of poverty, unemployment, and income inequality. Therefore, the municipalities' developmental priorities largely coincide:

- In order to optimise the resources directed at addressing these challenges, the Pixley ka Seme District set eight development priorities for the municipality (Pixley ka Seme District Municipality, 2014). These priorities are envisaged to be achieved through, among others, good service delivery, human and natural resource development, integrated rural and urban planning, employment creation and the development of a vibrant tourism industry (Pixley ka Seme DM, 2014, Pixley Ka Seme DM, 2013).
- The Siyathemba LM also prioritises an optimal distribution of resources, economic development through job creation and poverty reduction strategies, and effective and efficient service delivery to propel the development in the municipality (Siyathemba LM, 2014). Economic development is envisaged to be achieved through the support and growth of the priority sectors such as the agricultural, mining, manufacturing, tourism and retail sectors. Alternative energy sources have also been identified to be an anchor economic activity in the municipality that could propel local economic development through its linkages with other sectors.

It is clear that the proposed project is in line with the overall objectives of sustainable resource usage and economic development in the area.

When it comes to renewable energy development, both the Pixley ka Seme and Siyathemba municipalities' strategic documents largely focus on solar energy projects. The Siyathemba LM, and specifically the area outside Prieska, has already been designated for the establishment of a solar park (1 GW) and the municipality has already allocated communal land for this project (Siyathemba LM, 2014). The focus on solar energy projects is most probably attributed to the limited knowledge of the wind resource potential in the Northern Cape at the time of the formulation of the Provincial SDF, which informed local strategic documents and specifically the location of the renewable energy corridor area and its focus on solar energy projects.

Notably, limited reference to wind energy projects in the strategic documents of the local government do not in any way reduce the importance of wind energy project developments in the municipalities of Pixley ka Seme and Siyathemba. As mentioned earlier, such projects are seen in support of the government's objective to exploit renewable energy sources for the purpose of developing the local

economies and assist the district municipality in entrenching its position as a renewable energy hub. This is also confirmed by the fact that a number of wind energy facilities have already been approved for the development in the area under the RE IPPPP.

From a spatial framework perspective, the local municipality does not have an approved SDF. Therefore, assessing whether the proposed project is in contradiction with the spatial vision for the area where it is proposed to be developed is not possible. It should be mentioned though, that agriculture and tourism are considered by local government to be important contributors to the future growth and development of the local economy as well as towards achieving sustainable use of resources. This means that a land use analysis will need to be undertaken to determine whether the proposed project would limit the growth potential for the above-mentioned two sectors.

After considering the reviewed documentation, the proposed wind facility is in alignment with national, provincial and local objectives, plans and strategies relating to socio-economic development of the areas under analysis. There were no fatal flaws or contraventions identified as all spheres of government prioritise the development of renewable energy projects. The proposed project fits well with the plans to diversify the provincial, district and local economies through investment in renewable energy projects.

5 DESCRIPTION OF THE RECEIVING ENVIRONMENT

A general description of the study area is outlined in the section below. The receiving environment in relation to each specialist study is also provided.

5.1 Regional Locality

The proposed development will be located approximately 20km east of Copperton, within the Siyathemba Local Municipality of the Pixley ka Seme District Municipality in the Northern Cape Province (Figure 7). The proposed wind energy facility will be accessed by the N10 and the R357 which lies adjacent to the site. The centre point and corner co-ordinates for the development site are included in Table 8.

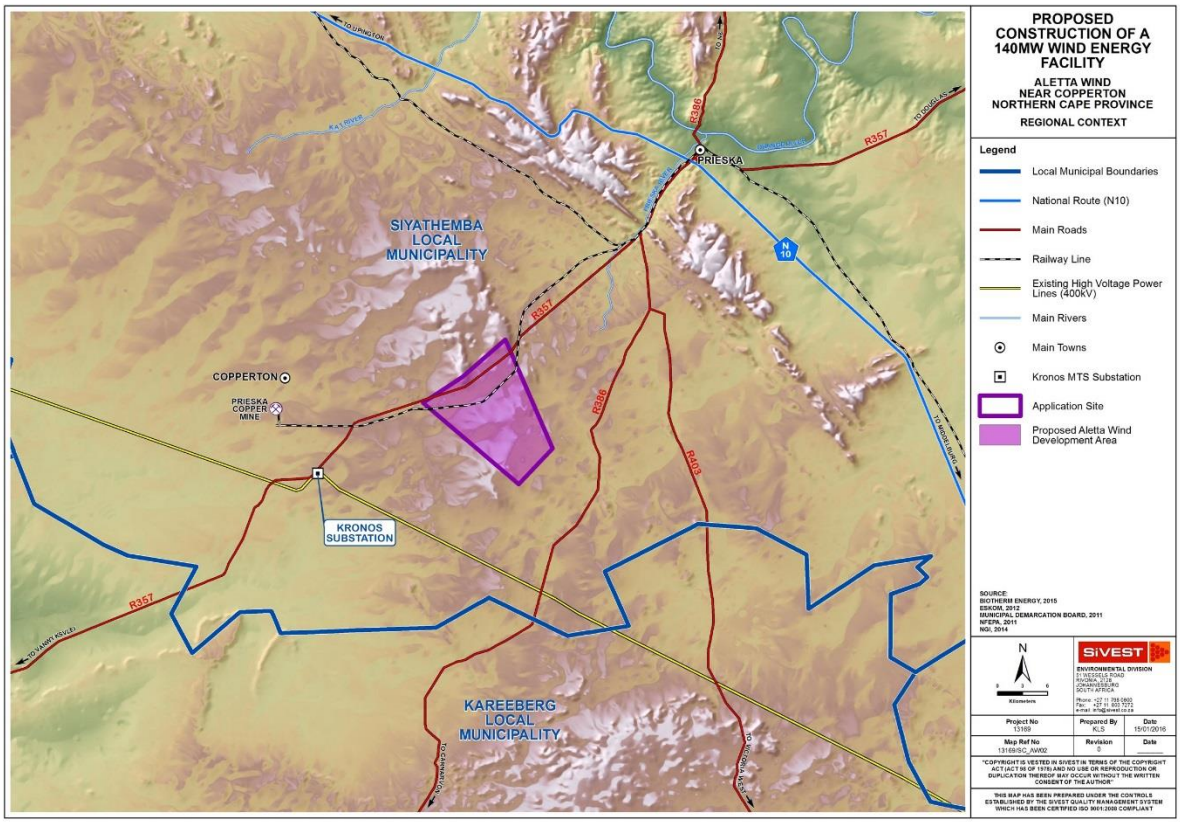


Figure 7: Regional Study Area.

5.2 Study Site Description

The site that is proposed for the Aletta wind energy facility near Copperton is located on the following farms:

- Portion 1 of Drielings Pan No.101; cadastral number: C06000000000010100001
- Portion 2 of Drielings Pan No.101; cadastral number: C06000000000010100002
- Portion 3 of Drielings Pan No.101; cadastral number: C06000000000010100003
- Remainder of Drielings Pan No.101; cadastral number: C06000000000010100000

Table 8: Application Site Location

ALETTA WIND: APPLICATION SITE & DEVELOPMENT AREA		
CORNER POINT COORDINATES		
POINT	**SOUTH**	**EAST**
A_01 (NW)	S29° 52' 51.794"	E22° 32' 27.848"
A_02 (NE)	S29° 59' 52.858"	E22° 35' 30.970"
A_03 (SE)	S30° 2' 11.890"	E22° 33' 19.076"
A_04 (SW)	S29° 56' 56.872"	E22° 27' 9.065"

Please note that all maps within the report are included in Appendix 5 and are in A3 format.

The application site as shown on the locality map below has a total developable area of 11 002 hectares (**Figure 8**). The entire application site has been assessed during the scoping phase, however, the 140MW wind energy facility layout will require only a portion of the area. The farm is currently used for sheep farming and the wind energy facility is not envisioned to affect farming activities after the construction phase had been completed.

Preliminary layouts are discussed in Chapter 7 of the FSR and are presented in the EIA plan of study in Chapter 11 of this report. These will be assessed in detail during the EIA phase, and refined to avoid sensitive areas as required.

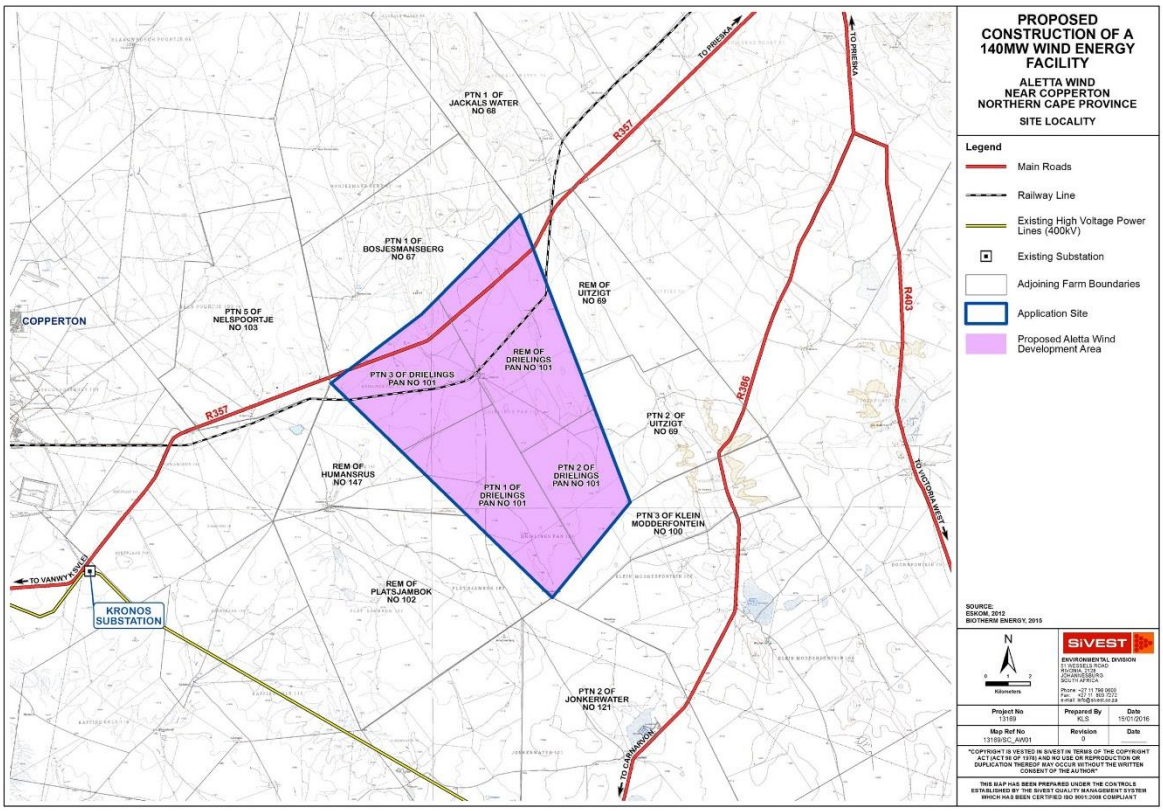


Figure 8: Site locality.

5.3 Topography

The topography of the study site and surrounds is shown below (**Figure 9**). The area lies at a height of approximately 1 100 to 1 150 metres above sea level. The topography within and in the immediate vicinity of the proposed application site is characterised by a flat to gently undulating landscape (typical of much of the Karoo), that gently slopes down in a south-easterly direction.

In addition, the topography in the wider area is characterised by a mix of level plains with some relief, as well as areas of slightly more undulating relief, including some plains with open hills or ridges). In the wider area, a low mountain range marks a change in topography; with the Doringberge forming a line of hills to the north-east of the application site. The degree of slope of the site and surrounding area are shown in **Figure 10**.

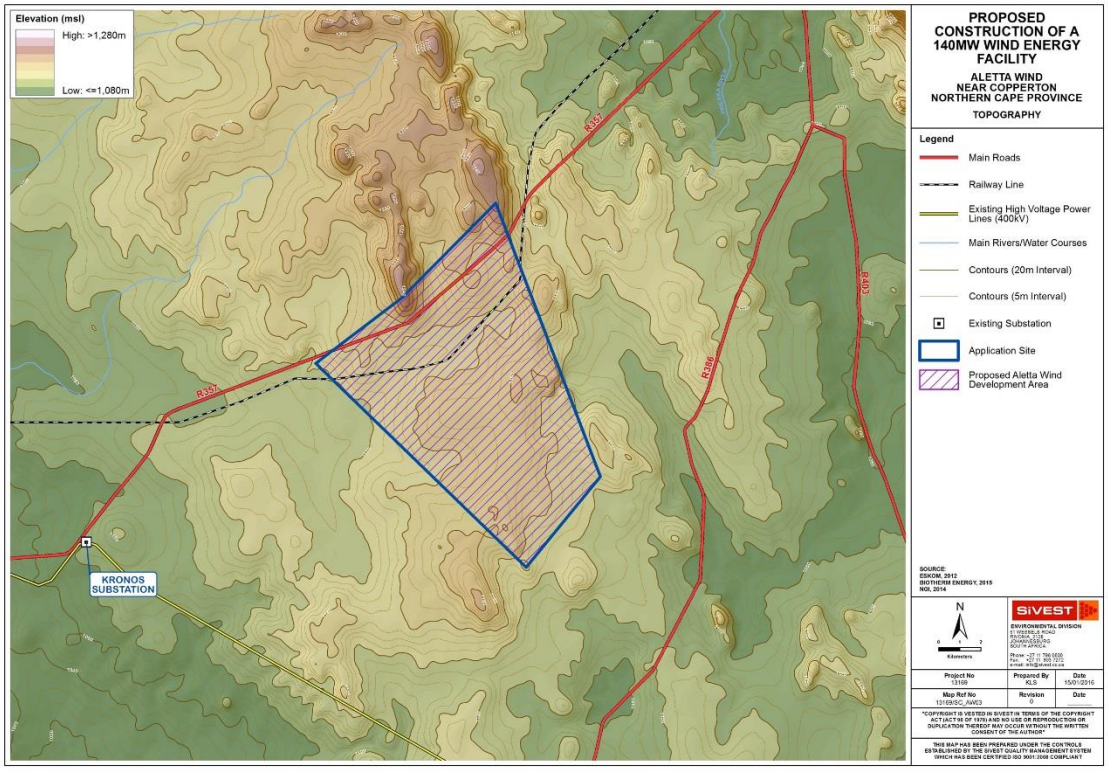


Figure 9: Topography of the study area.

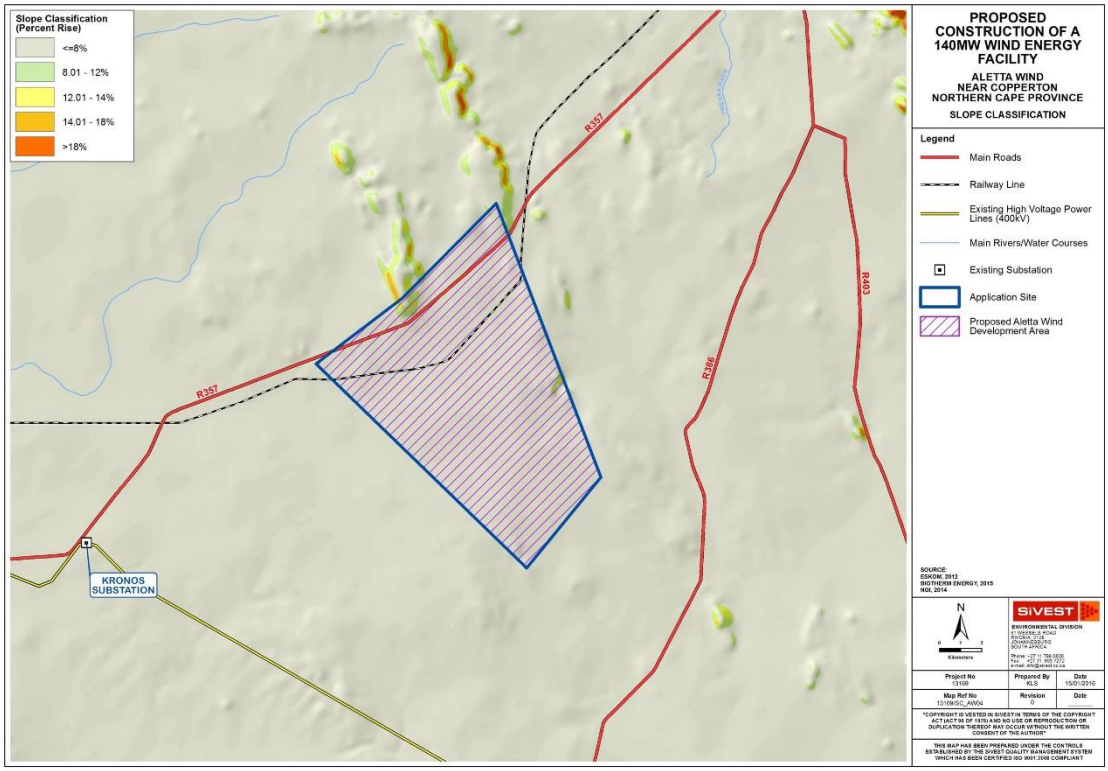


Figure 10: Degree of slope in region of the study area.

5.4 Geology

The geology of the area comprises quartzite of the Uitdraai Formation, Olifantshoek sequence (Geological Survey, 1977).

The distribution of the geological units in the area is shown in **Figure 11**.

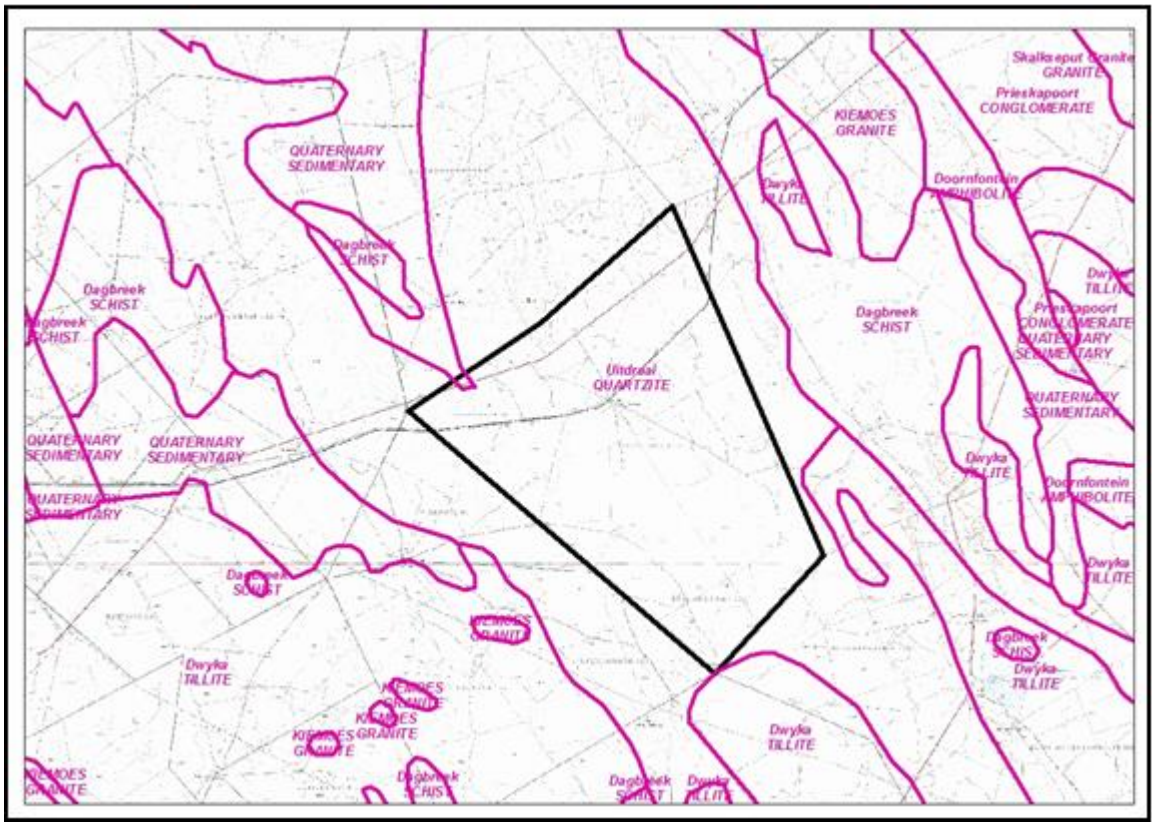


Figure 11: Geological units in the region of the study area

5.5 Land Use

Much of the assessment area is characterised by natural unimproved vegetation which is dominated by low shrubland (**Figure 12**). The highly arid nature of the area's climate has resulted in livestock rearing dominating being the dominant activity within the area. As such, the natural vegetation has been retained across the vast majority of the study area.

The nature of the climate and corresponding land use has also resulted in low stocking densities and relatively large farm properties across the area. Therefore the majority of the area is very sparsely populated, and relatively little human-related infrastructure exists.

Built form in areas where livestock rearing occurs is limited to isolated farmsteads, gravel access roads, ancillary farm buildings, telephone lines, fences and the remnants of disused workers' dwellings. It must also be noted that the R357 and R386 gravel roads traverse the northern and south-eastern sections of the study area respectively. In addition, a railway line also traverses the northern section of the study area.

The closest built-up areas include the small mining town of Copperton as well as the old Prieska Copper Mine which was closed in 1996. Copperton is located approximately 15km to the west of the application site while the old Prieska Copper Mine is located approximately 14km west. Within the above-mentioned parts of the study area, greater human influence is visible in the form of mining infrastructure and electricity transmission infrastructure. The infrastructure associated with the now-defunct mine still exists, with the headgear, as well as an old slimes dams being prominent landmarks. Nevertheless, patches of degraded land can be found within the application site, as well as to the south-east, south and west of the site respectively. These areas of degraded land appear to be localised along the R357 and R386 gravel roads, as well as the railway line. In addition, very small areas characterised by cultivation can be found to the south-west and north-east of the application site respectively.

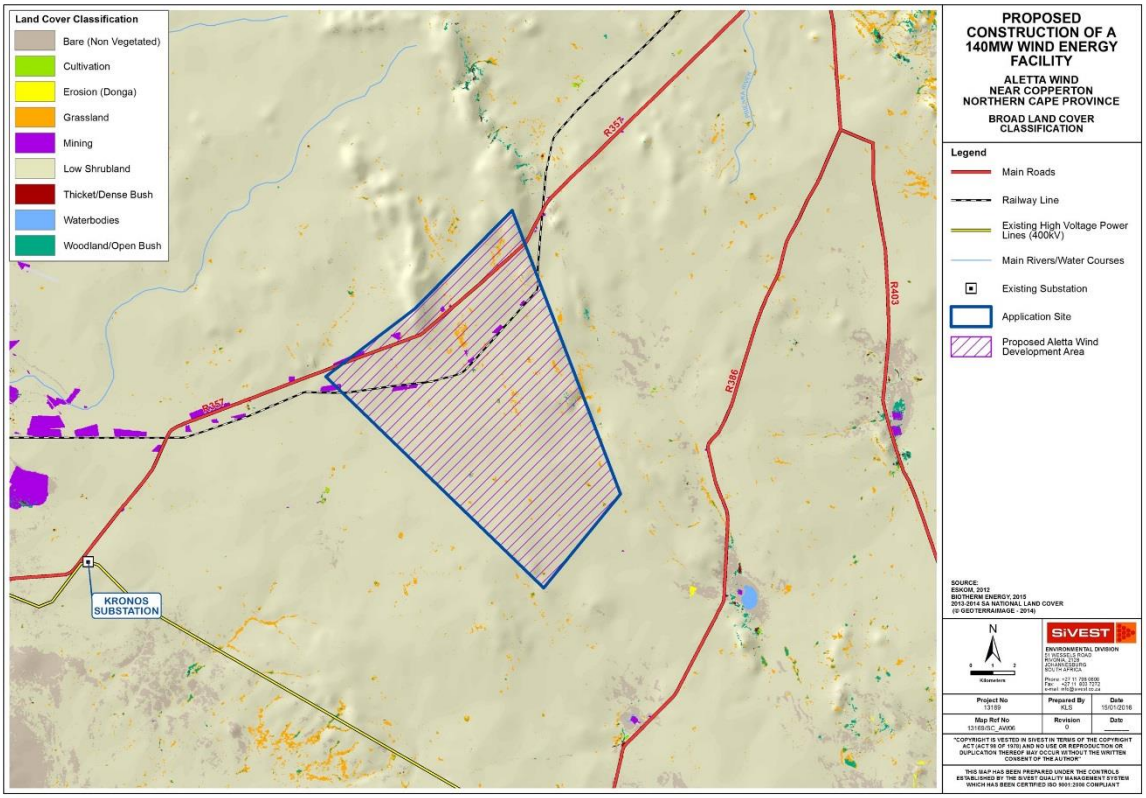


Figure 12: Land use in the region of the study area.

5.6 Climate

The climate of the study area (Monnik & Malherbe, 2005) can be regarded as warm to hot with occasional rain in summer and dry winters. The long-term average annual rainfall in this region of the Northern Cape is only 198 mm, of which 138 mm, or 69%, falls from November to April. Rainfall is erratic, both locally and seasonally and therefore cannot be relied on for agricultural practices. The average evaporation is over 2 100 mm per year, peaking at over 8.5 mm per day in December.

Temperatures vary from an average monthly maximum and minimum of 31.6ºC and 11.8ºC for January to 15.9ºC and 1.0oC for July respectively. The extreme high temperature that has been recorded is over 42ºC and the extreme low –10.0ºC. Frost occurs most years on 30-40 days on average between early May and mid-September.

5.7 Biodiversity

The Biodiversity Assessment was conducted by David Hoare and is included as Appendix 6A. The environmental baseline from a biodiversity perspective is presented below.

5.7.1 Landuse and landcover of the study area

A landcover map of the study area (Fairbanks et al. 2000) indicates that the study consists of natural vegetation, classified as “shrubland and low fynbos” and some small fragments of "thicket and bushland". The 1:50 000 topocadastral map of the site and a Google image of the site (**Figure 13**) show essentially the same pattern. Vegetation typical of the general study area is shown in **Figure 14**.

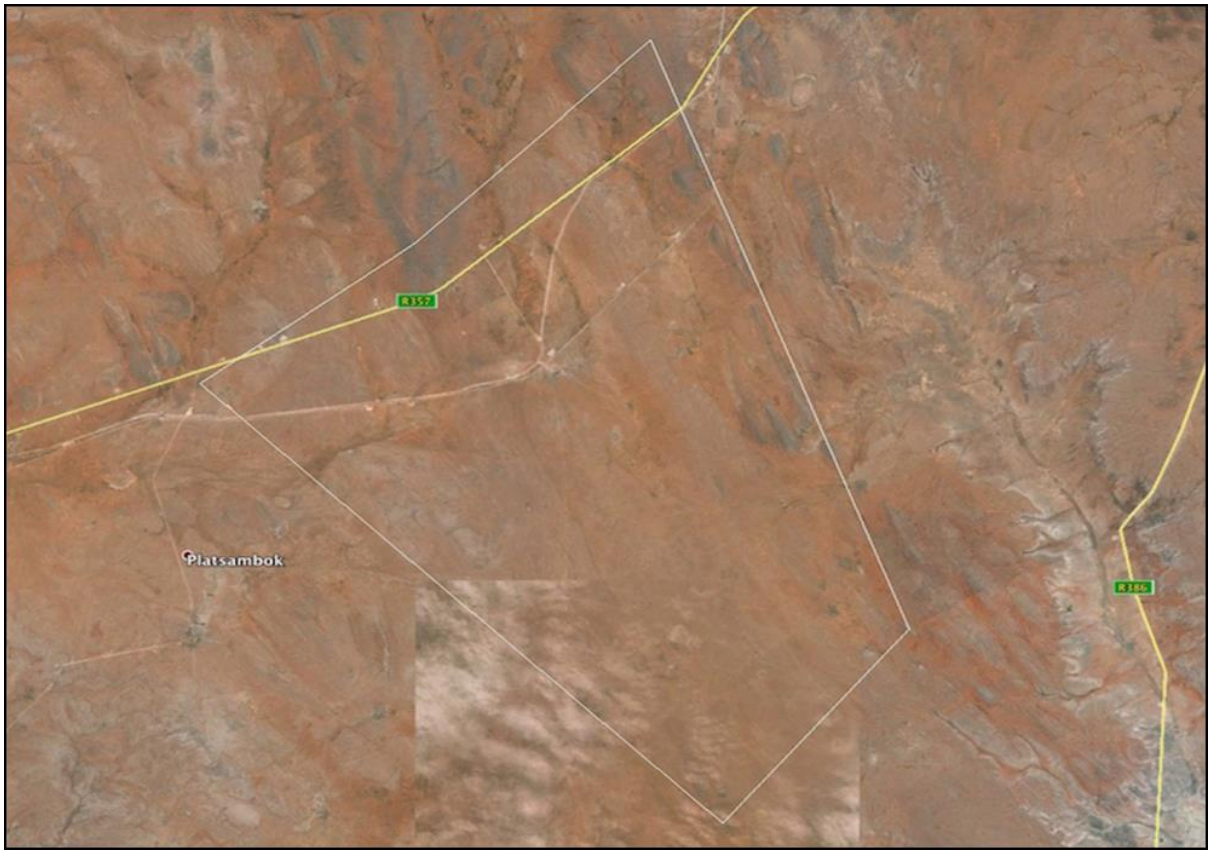


Figure 13: Aerial image of the study area.

Figure 14: Typical vegetation structure within the general study area.

5.7.2 Broad vegetation types of the region

The sites fall within the Nama-Karoo Biome (Rutherford & Westfall 1986, Mucina & Rutherford 2006). The most recent and detailed description of the vegetation of this region is part of a national map (Mucina, Rutherford & Powrie, 2005; Mucina et al. 2006). This map shows six vegetation types occurring within the broad study area (**Figure 15**), of which only two are affected directly by the proposed project alternatives. These vegetation types are described in more detail below.

- Bushmanland Arid Grassland

This vegetation type occurs on extensive, relatively flat plains and is sparsely vegetated by tussock grasses, including *Stipagrostis ciliata, Aristida adscensionis, Aristida congesta, Enneapogon desvauxii, Eragrostis nindensis, Schmidtia kalahariensis* and *Stipagrostis obtusa*. In some years after good rains there are abundant displays of annual herbs (Mucina et al. 2006). There are no known endemics in this vegetation type (Mucina et al. 2006), but does contain endemics belonging to the Griqualand West or Gariep Centres of Endemism (van Wyk & Smith 2001), namely *Aizoon asbestinum, Maerua gilgii, Ruschia muricata* and *Aloe gariepensis*. The vegetation type also contains the protected tree species, *Acacia erioloba* (camel thorn), *Acacia haematoxylon* (grey camel thorn) and *Boscia albitrunca* (shepherd's bush).

- Lower Gariep Broken Veld

This consists of sparse vegetation dominated by shrubs and dwarf shrubs, with annuals conspicuous, especially in spring, and perennial grasses and herbs occurring in low amounts. On the slopes of koppies groups of widely scattered low trees such as *Aloe dichotoma* occur and the sandy soils of footslopes *Acacia mellifera* occurs. Known endemics in this vegetation include the tall shrub *Caesalpinia bracteata* and the succulent shrub *Ruschia pungens* (Mucina et al. 2006). The vegetation contains endemics belonging to the Griqualand West or Gariep Centres of Endemism (van Wyk & Smith 2001), namely *Digitaria polyphylla* and *Crassula corallina* subsp. *macrorrhiza*. At a national scale this vegetation type has been transformed only a small amount and is also conserved in Augrabies Falls National Park. It is not considered to be a threatened vegetation type (Mucina et al. 2006).

- Bushmanland Basin Shrubland

This vegetation type occurs in the Northern Cape Province in the Large Bushmanland Basin centred on Brandvlei and Vanwyksvlei, from Granaatboskolk in the west to Copperton in the east and Kenhardt in the north to Williston in the south (Mucina et al. 2006). It is found on slightly irregular plains. The vegetation is a dwarf shrubland dominated by a mixture of low sturdy, spiny and sometimes succulent shrubs (*Rhigozum, Salsola, Pentzia* and *Eriocephalus*), white grasses and, in years of high rainfall, abundant annuals, such as *Gazania* and *Leysera*. In comparison to the bordering Bushmanland Arid Grasslad, the vegetation of this unit shows increased presence of shrubs and plant indicators of high salt status of soils.

- Bushmanland Vloere

This is the vegetation of the salt pans and broad riverbeds of the central Bushmanland basin (Mucina et al. 2006). It occurs in areas of flat and very even surfaces of pans and broad bottoms of intermittent dry rivers. Typically, the central parts are devoid of vegetation. Around this is loosely patterned scrub dominated by *Rhigozum trichotomum* and various species of *Salsola* and *Lycium*, with a mixture of karroid dwarf shrubs. In places loose thickets of *Parkinsonia africana, Lebeckia linearifolia* and *Acacia karroo* may be found.

- Northern Upper Karoo

This vegetation type occurs in the Northern Cape and Free State in the northern regions of the Upper Karoo Plateau from near Prieska, Vosburg and Carnarvon in the west to Philipstown, Petrusville and Petrusburg in the east. It is found on flat to gently sloping landscapes. The vegetation is a shrubland dominated by dwarf karoo shrubs, grasses and *Acacia mellifera* and some other low trees.

- Upper Karoo Hardeveld

This vegetation type is found in the Northern, Western and Eastern Cape Provinces in the region from Middelpos in the west to Strydenburg, Richmond and Nieu-Bethesda in the east. Most of the crest areas and steep slopes of the Great Escarpment facing south between Teekloofpas and Graaff-Reinet are

covered in this vegetation. The vegetation occurs on steep slopes of koppies, butts, mesas and parts of the Great Escarpment covered with large boulders and stones. The vegetation is a sparse dwarf Karoo scrub with drought-tolerant grasses. The vegetation unit contains a number of endemics, especially within the Great Escarpment part.

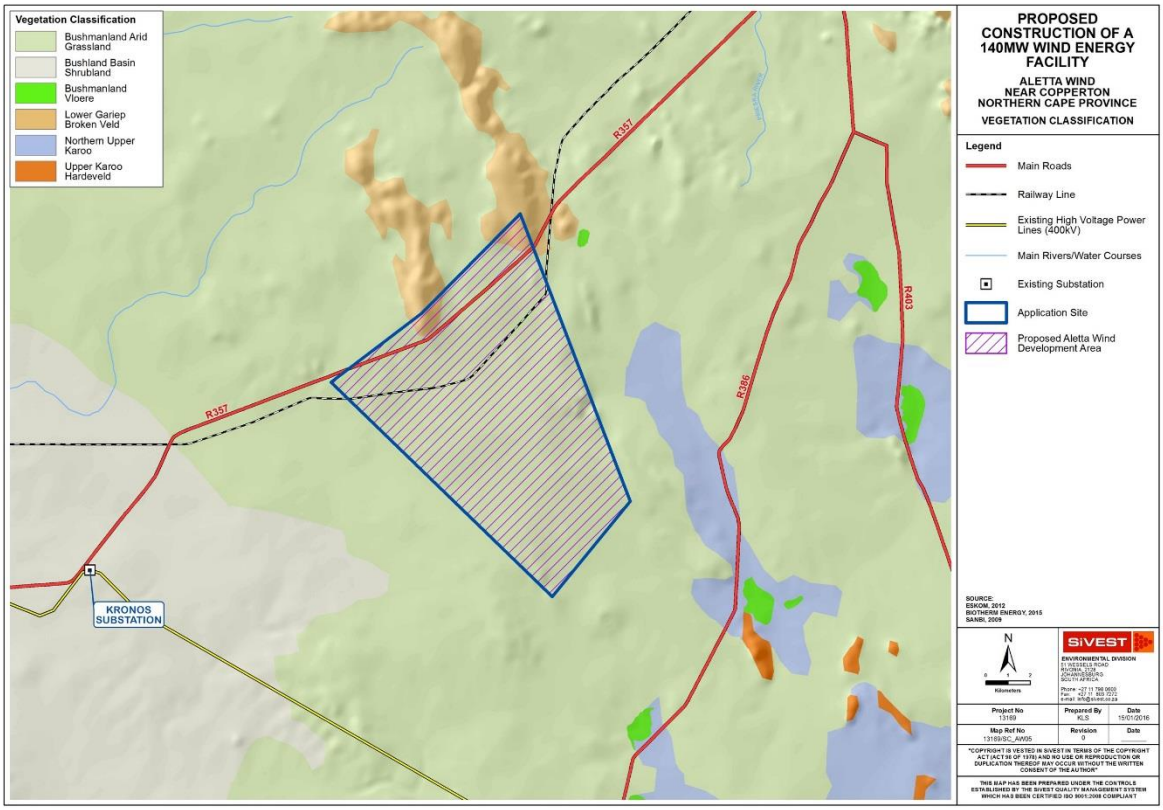


Figure 15: Vegetation types of the project study area

5.7.3 Conservation status of broad vegetation types

On the basis of a recently established approach used at national level by SANBI (Driver et al. 2005), vegetation types can be categorised according to their conservation status which is, in turn, assessed according to the degree of transformation relative to the expected extent of each vegetation type. The status of a habitat or vegetation type is based on how much of its original area still remains intact relative to various thresholds. The original extent of a vegetation type is as presented in the most recent national vegetation map (Mucina, Rutherford & Powrie 2005) and is the extent of the vegetation type in the absence of any historical human impact. On a national scale the thresholds are as depicted in **Table 9**, as determined by best available scientific approaches (Driver et al. 2005).

The level at which an ecosystem becomes Critically Endangered differs from one ecosystem to another and varies from 16% to 36% (Driver et al. 2005).

All of the vegetation types occurring in the study area (**Table 10**) are classified as Least Threatened (Driver et al. 2005; Mucina et al., 2006). None of the vegetation types are flagged therefore as being of conservation concern.

Table 9: Determining ecosystem status (from Driver et al. 2005)

*BT = biodiversity target (the minimum conservation requirement).

Habitat remaining (%)			
	80–100	least threatened	LT
	60–80	vulnerable	VU
	*BT–60	endangered	EN
	0–*BT	critically endangered	CR

Table 10: Conservation status of different vegetation types occurring in the study area, according to Driver *et al*. 2005 and Mucina *et al*. 2005.

Vegetation Type	**Target (%)**	**Conserved (%)**	**Transformed (%)**	**Conservation status**	
				Driver et al. 2005; Mucina et al., 2006	**Draft Ecosystem List (NEMBA)**
Bushmanland Arid Grassland	21	1	1	Least Threatened	Not listed
Lower Gariep Broken Veld	21	4	1	Least Threatened	Not listed
Bushmanland Basin Shrubland	21	0	1	Least Threatened	Not listed
Bushmanland Vloere	24	0	2	Least Threatened	Not listed
Northern Upper Karoo	21	0	4	Least Threatened	Not listed
Upper Karoo Hardeveld	21	3	0	Least Threatened	Not listed

5.7.4 Biodiversity Conservation Plans

There are no fine-scale biodiversity conservation plans for the study area (bgis.sanbi.org). According to SANBI, "*Presently BGIS has no Systematic Biodiversity Conservation Plan for the Northern Cape other than the Namakwa District Biodiversity Sector Plan therefore the Biodiversity Summaries Map is used in it place for land use decision support in the province*." The Biodiversity Summary Map for the Pixley ka Seme District Municipality shows all natural vegetation within the municipal area, except along the Orange River, to be Least Threatened and no areas mapped as of particular biodiversity concern.

5.7.5 Proposed Protected Areas

According to the National Parks Area Expansion Strategy (NPAES), the central part of the site has been identified as a priority area for inclusion in future protected areas. According to the guideline description of the strategy, the "*focus areas for land-based protected area expansion are large, intact and*

unfragmented areas of high importance for biodiversity representation and ecological persistence, suitable for the creation or expansion of large protected areas. The focus areas were identified through a systematic biodiversity planning process undertaken as part of the development of the National Protected Area Expansion Strategy 2008 (NPAES). They present the best opportunities for meeting the ecosystem-specific protected area targets set in the NPAES, and were designed with strong emphasis on climate change resilience and requirements for freshwater ecosystems. These areas should not be seen as future boundaries of protected areas, as in many cases only a portion of a particular focus area would be required to meet the protected area targets set in the NPAES". No description is provided of specific biodiversity features per proposed area.

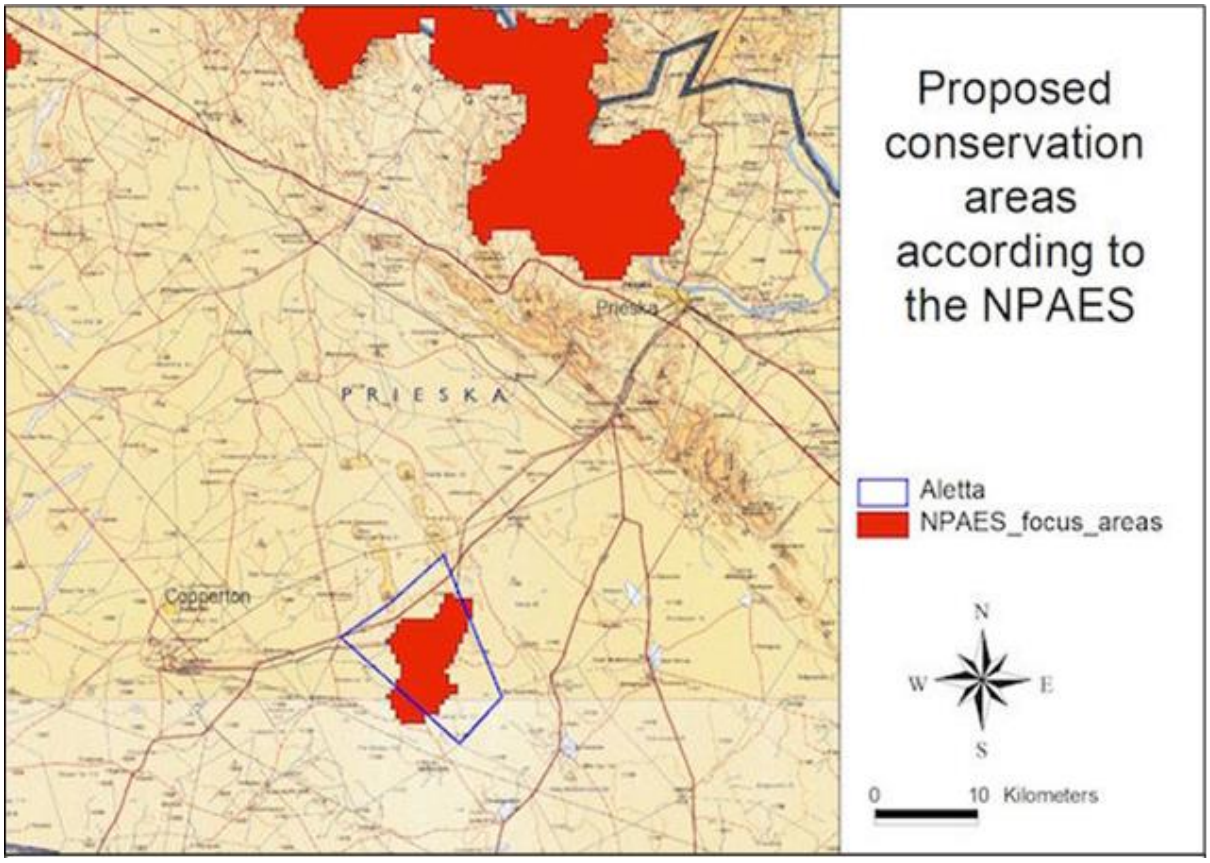


Figure 16: Proposed National Park expansion areas according to the NPAES

5.7.6 Red List plant species of the study area

Lists of plant species of conservation concern previously recorded in the quarter degree grids in which the study area is situated were obtained from the South African National Biodiversity Institute. These are listed in the Biodiversity specialist report. Additional species that could occur in similar habitats, as determined from database searches and literature sources, but have not been recorded in these grids are also listed.

There is one species that may occur in the study area, the succulent, *Hoodia officinalis* subsp. *officinalis*. This species is listed as Near Threatened (see **Table 11** for explanation of categories). The species is

found in Desert, Nama Karoo and Succulent Karoo and is found inside bushes in flat or gently sloping areas. The species has been recorded in two neighbouring grids and the possibility of it occurring in the study area is therefore considered to be high.

There is another Near Threatened plant species that could potentially occur in the study area, namely *Drimia sanguinea*. The main occurrence of this species is, however, more to the north and north-east of the current site.

Table 11: Explanation of IUCN Ver. 3.1 categories (IUCN, 2001), and Orange List categories (Victor & Keith, 2004).

IUCN / Orange List category	**Definition**	**Class**
EX	Extinct	Extinct
CR	Critically Endangered	Red List
EN	Endangered	Red List
VU	Vulnerable	Red List
NT	Near Threatened	Orange List
Declining	Declining taxa	Orange List
Rare	Rare	Orange List
Critically Rare	Rare: only one subpopulation	Orange List
Rare-Sparse	Rare: widely distributed but rare	Orange List
DDD	Data Deficient: well-known but not enough information for assessment	Orange List
DDT	Data Deficient: taxonomic problems	Data Deficient
DDX	Data Deficient: unknown species	Data Deficient

5.7.7 Red List animal species of the study area

All Red List vertebrates (mammals, birds, reptiles, amphibians) that could occur in the study area are listed in the biodiversity specialist report.

There are four mammal species of low conservation concern that could occur in available habitats in the study area. These are Geoffroy's Horseshoe Bat, Darling's Horseshoe Bat, Leseuer's Wing-gland Bat, the Honey Badger and Littledale's Whistling Rat. All of these species are classified nationally as near threatened (NT), but globally as Least Concern. They are, therefore, of relatively low conservation concern in comparison to more threatened species found in other parts of the country. The Honey Badger protected under the National Environmental Management: Biodiversity Act and any impacts on a specimen of this species or that may negatively affect the survival of the species would require a permit. Only the Honey Badger and Littledale's Whistling Rat were considered likely to be found on site.

The Giant Bullfrog is the only amphibian species with a distribution that includes the study area and which could occur on any of the sites. This species is classified as Least Concern globally and Near threatened in South Africa. It is, however, protected under the National Environmental Management: Biodiversity Act and any impacts on a specimen of this species or that may negatively affect the survival of the species would require a permit.

There are no reptile species of conservation concern that have a distribution that includes the study area.

5.7.8 Protected Plants (National Environmental Management: Biodiversity Act)

Plant species protected under the National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004) are listed in the biodiversity specialist report. Two plant species that appear on this list that could potentially occur in the general region, although they have not previously been recorded in the grids of the study area, are *Hoodia gordonii* and *Harpagophytum procumbens*.

Hoodia gordonii is found in Namibia, Botswana, Angola and the dry margins of the summer rainfall region of South Africa, including parts of the Western Cape, Northern Cape and Free State Provinces. It occurs in a wide variety of arid habitats from coastal to mountainous, also on gentle to steep shale ridges, found from dry, rocky places to sandy spots in riverbeds. It has not been previously recorded in this grid, but has been recorded in the grid to the north-east. It is considered likely that this species could occur on site due to habitat conditions found there relative to the species requirements.

Harpagophytum procumbens occurs in Angola, Botswana, Mozambique, Namibia, South Africa, Zambia, and Zimbabwe. Within South Africa this species occurs in the Northern Cape, North West, Free State, and Limpopo Provinces and the largest populations are found in the communally owned areas of the North West Province and the north eastern parts of the Northern Cape. The species requires well drained sandy habitats in open savanna and woodlands. It has not been previously recorded in this grid, but has been recorded in the grids to the south and north. It is considered possible, but unlikely that this species could occur on site due to habitat conditions found there relative to the species requirements.

5.7.9 Protected plants (Northern Cape Nature Conservation Act, No. 9 of 2009)

The Act provides lists of protected species for the Province, which is very lengthy and includes a number of common species. According to Northern Cape Nature Conservation officials, a permit is required for the removal of any species on this list. Based on previous experience on projects in the Northern Cape Province, it must be assumed that a permit application will need to be undertaken and that it will include a variety of species found on site, including various common species.

5.7.10 Protected trees

Tree species protected under the National Forest Act are listed in the biodiversity specialist report. The only one that has a geographical distribution that includes the study sites is *Boscia albitrunca* (Shepherd's Tree / Witgatboom / !Xhi). *Boscia albitrunca* (Shepherd's Tree / Witgatboom / !Xhi) occurs in semi-desert areas and bushveld, often on termitaria, but is common on sandy to loamy soils and calcrete soils. In the study area, it has been previously observed in the type of habitat found on the low hills that occur on site. This species could therefore potentially occur on site in areas affected by the proposed project.

5.7.11 Protected Animals

There are a number of animal species protected according to the National Environmental Management: Biodiversity Act (Act No. 10 of 2004). According to this Act, "*a person may not carry out a restricted activity involving a specimen of a listed threatened or protected species without a permit issued in terms of Chapter 7".* Such activities include any that are "*of a nature that may negatively impact on the survival of a listed threatened or protected species*". This implies that any negative impacts on habitats in which populations of protected species occur or are dependent upon would be restricted according to this Act.

Those species protected according to the National Environmental Management: Biodiversity Act (Act No. 10 of 2004) that have a geographical distribution that includes the site are listed in the biodiversity specialist report, marked with the letter "N". This includes the following species: White Rhinoceros, Black Wildebeest, Oribi, Cheetah, Cape Clawless Otter, Black-footed Cat, Brown Hyaena, Serval, Spotted-necked Otter, Honey Badger, Leopard, Cape Fox, Southern African Hedgehog, Southern African Python and Giant Bullfrog.

Due to habitat and forage requirements and the fact that some species are restricted to game farms and/or conservation areas, only the Black-footed Cat, Honey Badger, Leopard, Cape Fox and Giant Bullfrog have a likelihood of occurring on site. All of these species are mobile animals that are likely to move away in the event of any activities on site disturbing them. They are therefore unlikely to be affected by the proposed development of the wind energy facility and associated infrastructure.

5.7.12 Habitats on site

Aerial imagery indicates that most of the site consists of natural vegetation (karroid dwarf shrubland called Bushmanland Arid Grassland). There are drainage lines running through the site and a number of small pan depressions. There are also some low hills along the northern and eastern boundary of the site within which a low scrubby vegetation is expected to occur. The distribution of main habitats on site is shown in **Figure 17**.

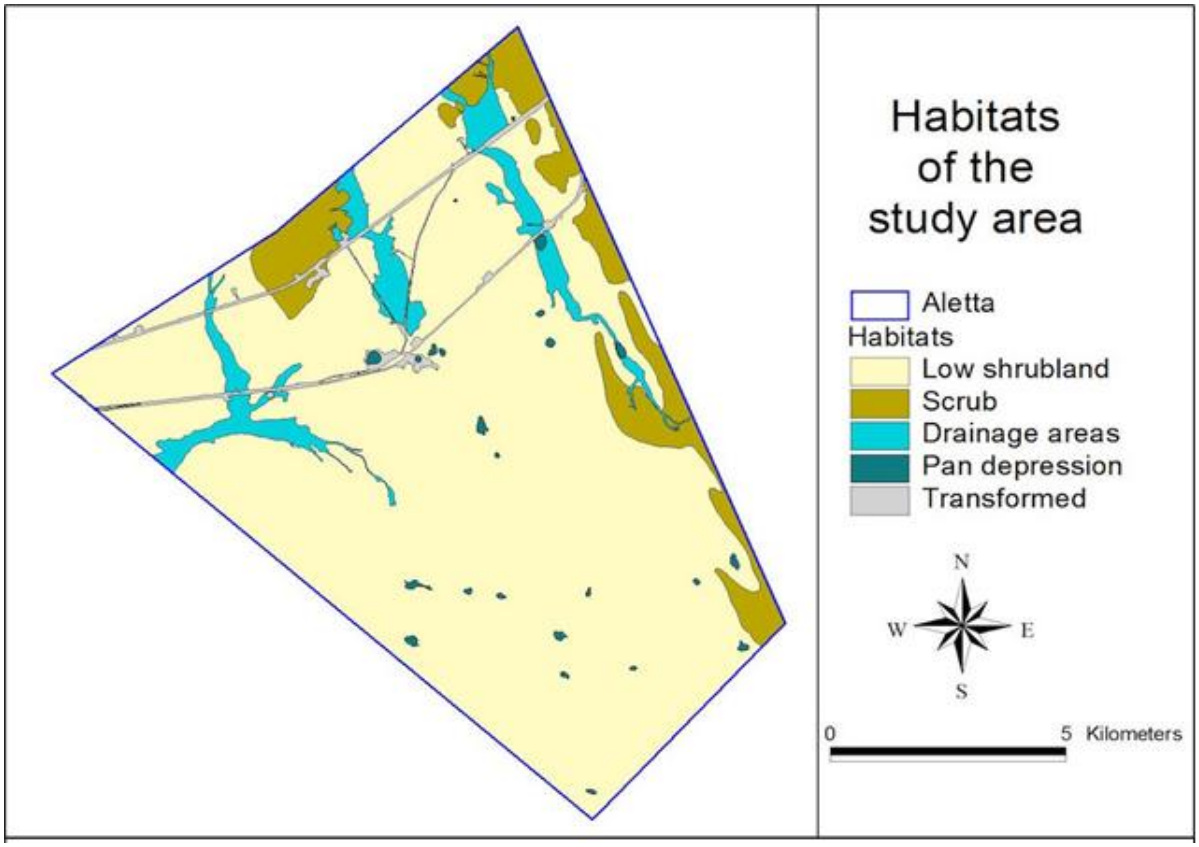


Figure 17: Main habitats of the study area

5.7.13 Watercourses

The study area contains some watercourses / drainage lines. These are visible on aerial imagery and are shown in **Figure 17**. Wetlands, riparian zones and watercourses are defined in the National Water Act as a water resource and any activities that are contemplated that could affect the wetlands requires authorisation (Section 21 of the National Water Act of 1998). It is important that these areas are properly mapped and that impacts on them are kept to a minimum, if possible.

5.7.14 Sensitivity assessment

The sensitivity assessment identifies those parts of the study area that have high conservation value or that may be sensitive to disturbance. Areas of potentially high sensitivity are shown in Figure 18. The information provided in the preceding sections was used to compile a map of remaining natural habitats and areas important for maintaining ecological processes in the study area. The only features of potential concern that need to be taken into account in order to evaluate sensitivity in the study area is the presence of non-perennial watercourses and pan depressions. These represent ecological processes, including groundwater dynamics, hydrological processes, nutrient cycling and wildlife dispersal.

These factors have been taken into account in evaluating sensitivity within the study area. Watercourses are considered to be the most sensitive features on site. The sensitivity classification is as follows:

- MEDIUM-HIGH: All of the watercourses, pans and drainage areas on site are classified as having medium-high sensitivity (see **Figure 18**). They are protected according to the National Water Act (Act 36 of 1998). Ecologically, they are areas that provide moderate value ecosystem goods and services.
- MEDIUM: The majority of the study area is classified as having medium sensitivity (see **Figure 18**). These are areas of natural vegetation which harbour no particular features of conservation concern, except for habitat that is potentially suitable for five near threatened animal species and one near threatened plant species (none confirmed to occur on site).
- LOW: Transformed areas are classified as having low sensitivity (see **Figure 18**). These are areas in which no intact natural habitat still remains.

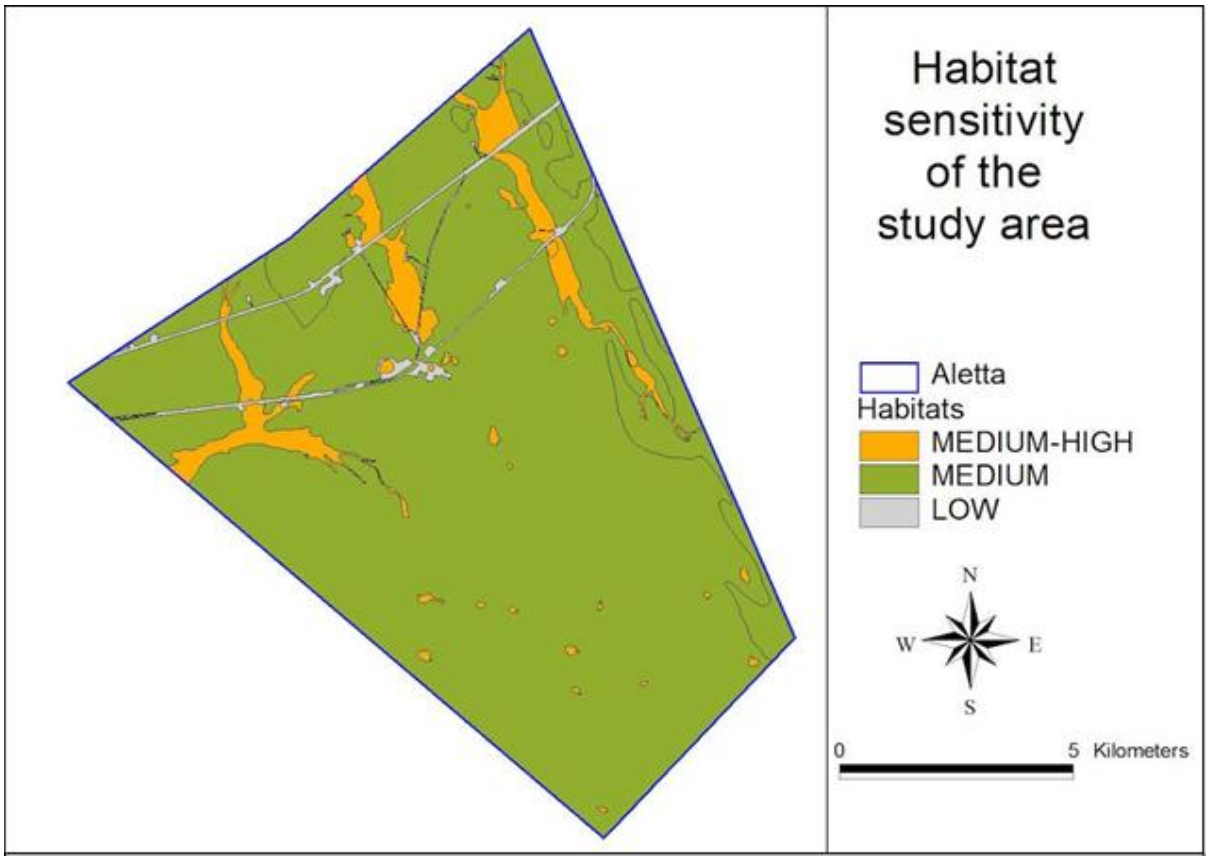


Figure 18: Habitat sensitivity of the study area

5.8 Avifauna

The Avifauna Assessment was conducted by Chris van Rooyen and is included as Appendix 6B. The environmental baseline from an avifaunal perspective is presented below.

5.8.1 Biomes and Vegetation Types

The study area is not located in an Important Bird Area. The closest Important Bird Area (IBA), the Platberg Karoo Conservancy IBA SA037 is located approximately 300km away (Barnes 1998, Birdlife 2014).

The habitat in the broader development area is highly homogenous and consists of extensive sandy and gravel plains with low shrub. Although Mucina & Rutherford (2006) classify the vegetation as Bushmanland Arid Grassland, the dominant vegetation type leans more towards Bushmanland Basin Shrubland. Bushmanland Basin Shrubland consists of dwarf shrubland dominated by a mixture of low, sturdy and spiny (and sometimes also succulent) shrubs (*Rhigozum, Salsola, Pentzia, Eriocephalus*), 'white' grasses (*Stipagrostis*) and in years of high rainfall also abundant annual flowering plants such as species of *Gazania* and *Leysera* (Mucina & Rutherford 2006).

SABAP1 recognises six primary vegetation divisions within South Africa, namely (1) Fynbos (2) Succulent Karoo (3) Nama Karoo (4) Grassland (5) Savanna and (6) Forest (Harrison et al. 1997). The criteria used by the authors to amalgamate botanically defined vegetation units, or to keep them separate were (1) the existence of clear differences in vegetation structure, likely to be relevant to birds, and (2) the results of published community studies on bird/vegetation associations. It is important to note that no new vegetation unit boundaries were created, with use being made only of previously published data. Using this classification system, the natural vegetation in the study area is classified as Nama Karoo. Nama Karoo is dominated by low shrubs and grasses; peak rainfall occurs in summer from December to May. Average daily temperatures range between 35°C in January and 18°C in July (http://www.worldweatheronline.com/Copperton-weather-averages/Northern-Cape/ZA.aspx). Trees, e.g. *Vachellia karroo* are mainly restricted to ephemeral watercourses, but in the proposed development area, due to the extreme aridity (average annual precipitation 147mm in the 12 years from 2000 – 2012 - http://www.worldweatheronline.com) the ephemeral watercourses contain only small stunted trees and dense shrubs. In comparison with the Succulent Karoo, the Nama Karoo has higher proportions of grass and tree cover.

5.8.2 Habitat classes and avifauna in the study area

Whilst much of the distribution and abundance of the bird species in the study area can be explained by the description of the biomes and vegetation types above, it is as important to examine the modifications which have changed the natural landscape, and which may have an effect on the distribution of avifauna. These are sometimes evident at a much smaller spatial scale than the biome or vegetation types, and are determined by a host of factors such as topography, land use and man-made infrastructure.

The following bird habitat classes were identified in the study area:

- *Nama Karoo*

This habitat class is described above. The Karoo vegetation types support a particularly high diversity of bird species endemic to Southern Africa, particularly in the family *Alaudidae* (Larks) (Harrison et al. 1997). Its avifauna typically comprises ground-dwelling species of open habitats. Many typical karroid species are nomads, able to use resources that are patchy in time and space, especially enhanced conditions associated with rainfall (Barnes 1998). Priority species specifically associated with Nama Karoo which could potentially occur regularly in the study area are the nomadic Ludwig's Bustard, which may occur in flocks following rainfall events, Karoo Korhaan, Double-banded Courser, Martial Eagle, Sclater's Lark, Black-chested Snake-eagle, Jackal Buzzard, Steppe Buzzard, Southern Pale Chanting Goshawk, Northern Black Korhaan, Greater Kestrel Spotted Eagle-Owl and Lanner Falcon. Kori Bustard, Secretarybird, Jackal Buzzard, and Verreaux's Eagle could occur irregularly. Black Harrier was recorded by SABAP1, but it is likely to occur only as a vagrant (see **Table 12** below for a complete list of priority species which could potentially occur at the site).

- *Waterbodies*

Surface water is of specific importance to avifauna in this arid study area. The study area contains at least nine boreholes and a small pan. Boreholes with open water troughs are important sources of surface water and are used extensively by various species, including large raptors, to drink and bath. Flocks of small birds congregate in large numbers around water troughs which in turn attracts priority species such as Lanner Falcon and Southern Pale Chanting Goshawk. If the small pan regularly holds water, it could attract all of the above as well as a variety of waterbirds. The Red listed Greater Flamingo could potentially be attracted to open water in this arid region, but it has not been recorded by SABAP2, which indicates that the species does not occur regularly. Pans are endorheic wetlands having closed drainage systems; water usually flows in from small catchments but with no outflow from the pan basins themselves. They are characteristic of poorly drained, relatively flat and dry regions. Water loss is mainly through evaporation, sometimes resulting in saline conditions, especially in the most arid regions. Water depth is shallow (<3m), and flooding characteristically ephemeral (Harrison et al. 1997). In this instance the pan is very small and unlikely to hold water regularly, which makes the occurrence of flamingos unlikely.

- *Trees*

The study area is generally devoid of trees, except for isolated clumps of trees at two of the water points, where a mixture of alien and indigenous trees are growing. The trees could attract a variety of species for purposes of nesting. Priority species that could potentially use the trees in this manner are Southern Pale Chanting Goshawk, Black-chested Snake-eagle and Spotted Eagle-Owl. The trees could also serve as hunting perches / roosting substrate for several priority raptors such as Martial Eagle, Verreaux's Eagle, Steppe Buzzard, Jackal Buzzard, Lanner Falcon and Greater Kestrel. A Southern Pale Chanting Goshawk nest was recorded in a clump of trees at a water point (29°56'34.42"S 22°32'55.35"E) and will be monitored during subsequent monitoring surveys to establish if the nest is active.

- *High voltage lines and telephone lines*

High voltage lines are an important potential roosting and breeding substrate for large raptors in the greater study area. There are no existing high voltage lines crossing the actual study area, but there are sub-transmission lines on 5-pole wooden structures running north and south of the site.

High voltage lines hold a special importance for large raptors (Jenkins et al. 2006). A Martial Eagle nest site on the Hydra-Kronos 400 kV line was initially recorded in the early 2000s in surveys of large raptors nesting on Eskom's transmission network in the Karoo (Jenkins et al. 2013). The presence of the nest was re-confirmed in 2013, with a pair of adults in attendance at a nest on tower 519 (30º 01.579 S, 22º 20.675 E) in May 2013, and feeding a small chick in August of the same year. This chick was successfully fledged by November, and at least one adult was present in the area, with the nest showing signs of preparation for the upcoming breeding season, in March 2014 (Jenkins & Du Plessis 2014). The nest was inspected during the site visit in June 2015, but the birds were not observed, which is an indication that the nest may not be active this year. At the time of the site visit, there was extensive activity at the Kronos MTS with continuous movements of trucks and pedestrians, which may account for the absence of the eagles at this specific nest site. The nest was again inspected in August 2015 and January 2016, but there was no sign of the birds. Although the nest is too far away to be directly impacted by the construction activity at the site, the proposed grid connection could potentially impact on the eagle nest through displacement due to disturbance associated with the construction of the power line, if the grid connection terminates in Kronos MTS. However, indications are that the birds have abandoned the nest, most likely due to disturbance.

There is also a telephone line next to the R357 tar road running through the north of the site. The poles are used extensively by Sociable Weavers Philetairus socius for nesting. A Verreaux's Eagle pair is breeding on a Sociable Weaver nest on one of the poles approximately 1.65km east of the western border of the site. The nest was active in June 2015.

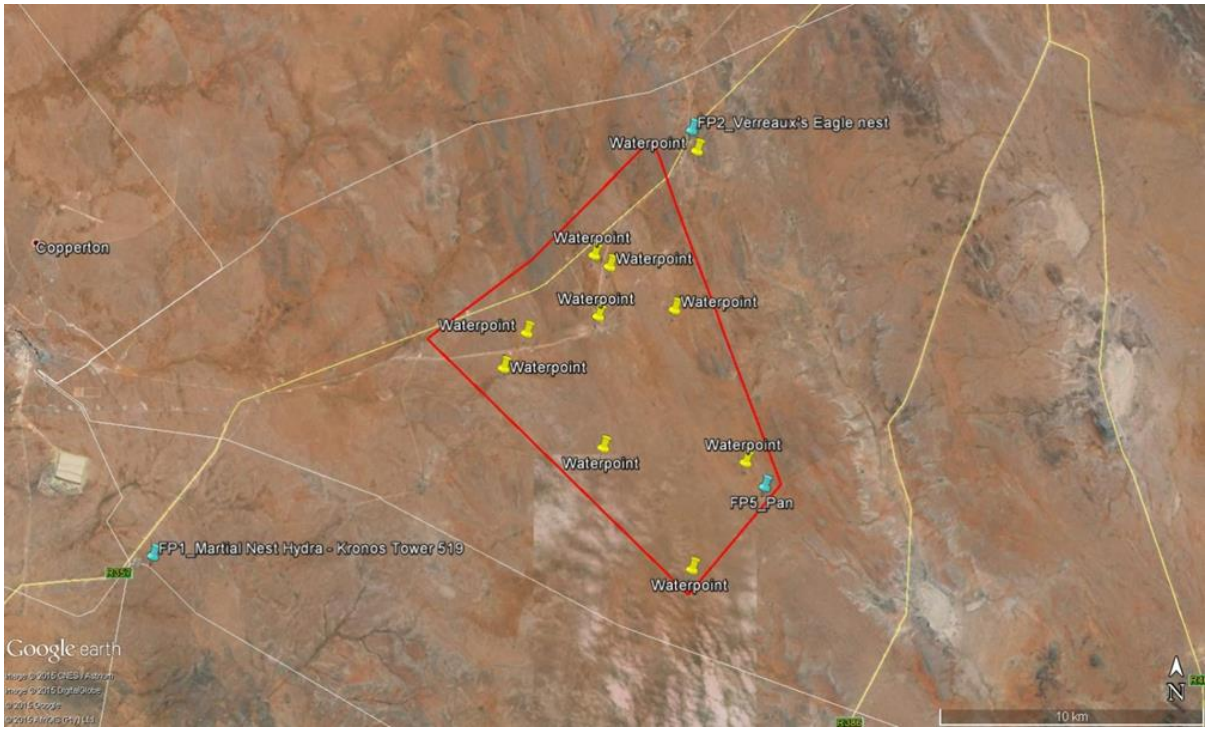


Figure 19: The location of waterpoints, high voltage lines (white lines) and large raptor nests in the study area

- *Avifauna*

An estimated 161 species could potentially occur in the study area. Of these, 56 are likely to occur only as vagrants or sporadically when conditions are optimal, i.e. after exceptionally good rains. Of the 161 species that could occur at the site, 22 are classified as priority species for wind farm developments (Retief et al. 2012).

See the avifaunal specialist report for a list of species potentially occurring in the study area. Potential impacts on priority species are listed in **Table 12**.

Table 12: Priority species potentially occurring in the study area

EN = Endangered
VU = Vulnerable
NT = Near-threatened
LC = Least concern
End = Southern African Endemic
N-End = Southern African near endemic

Name	Scientific name	National Red Data Status	Global status	SABAP2 reporting rate %	Priority species score	Collisions with associated power line	Collisions with turbines	Displacement through disturbance	Displacement through habitat transformation*
Double-banded Courser	*Rhinoptilus africanus*	NT	LC	13.79	204		x	x	x
Black Harrier	*Circus maurus*	EN	VU	0	345		x		
Jackal Buzzard	*Buteo rufofuscus*	End	LC	0	250		x		
Greater Flamingo	*Phoenicopterus ruber*	NT	LC	0	290	x	x		
Black-chested Snake-eagle	*Circaetus pectoralis*	-		3.45	230		x		
Chetsnut-banded Plover	*Charadrius pallidus*	NT	NT	0	230		x		x
Black Kite	*Milvus migrans*	-	-	0	220		x		
White Stork	*Ciconia ciconia*	-	-	0	220	x	x	x	x
Spotted Eagle-Owl	*Bubo africanus*	-	-	3.45	170		x		

Greater Kestrel	*Falco rupicoloides*	-	-	24.14	174		x		
Steppe Buzzard	*Buteo vulpinus*	-	-	3.45	210		x		
Karoo Korhaan	*Eupodotis vigorsii*	NT, End	LC	72.41	240		x	x	x
Kori Bustard	*Ardeotis kori*	NT	NT	13.79	260	x	x	x	x
Lanner Falcon	*Falco biarmicus*	VU	LC	3.45	300		x		
Ludwig's Bustard	*Neotos ludwigii*	EN, N-end	EN	48.28	320	x	x	x	x
Martial Eagle	*Polemaetus bellicosus*	EN	VU	13.79	350		x	x	
Northern Black Korhaan	*Afrotis afraoides*	End	LC	82.76	180	x	x	x	x
Sclater's Lark	*Spizocorys sclateri*	NT, End	NT	10.34	240		x		
Secretarybird	*Sagittarius serpentarius*	VU	VU	3.45	320	x	x	x	x
Southern Pale Chanting Goshawk	*Melierax canorus*	N-end	LC	79.21	200		x		
Verreaux's Eagle	*Aquila verreauxii*	VU	LC	17.24	360		x		

With smaller species this impact might result in partial but not total exclusion from the site.

5.9 Bats

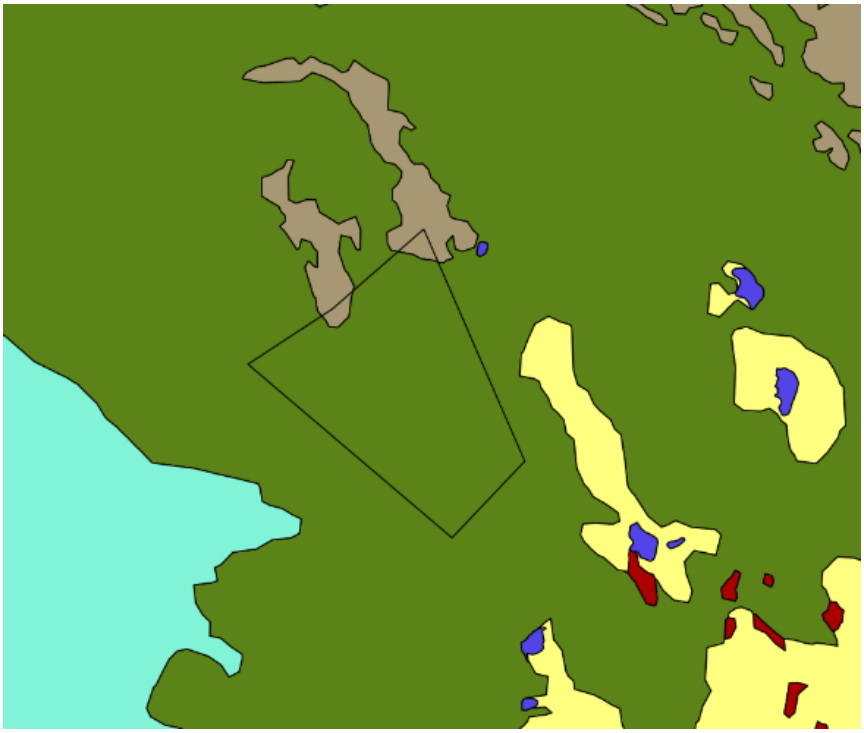
The Bat Assessment was conducted by Monika Moir and Werner Marais of Animalia. The full report is included in Appendix 6C. The environmental baseline from a bat perspective is presented below.

5.9.1 Land Use, Vegetation, Climate and Topography

Vegetation units and geology are of great importance as these may serve as suitable sites for the roosting of bats and support of their foraging habits (Monadjem et al. 2010). Houses and buildings may also serve as suitable roosting spaces (Taylor 2000; Monadjem et al. 2010). The importance of the vegetation units and associated geomorphology serving as potential roosting and foraging sites have been described in **Table 13** below.

Table 13: Potential of the vegetation to serve as suitable roosting and foraging spaces for bats.

Vegetation Unit	Roosting Potential	Foraging Potential	Comments
Bushmanland Arid Grassland	Moderate	Low	Very little natural roosting space is available and may be limited to the higher and denser vegetation in the drainage systems. Foraging will mostly be by open space foraging bats species.
Lower Gariep Broken Veld	Low - Moderate	Low - Moderate	The vegetation unit does not present a lot of roosting potential apart from low trees and man-made structures. The unit will provide adequate foraging opportunities, especially open air foraging bat species.



Northern Upper Karoo
Bushmanland Basin Shrubland
Bushmanland Arid Grassland
Lower Gariep Broken Veld
Bushmanland Vloere
Upper Karoo Hardeveld
Site Boundary

ANiMALiA
zoological & ecological consultation

Figure 20: Vegetation units present on the Aletta 1 wind energy facility study area (Mucina and Rutherford 2006)

5.9.2 Water sources and nearby protected areas

Figure 21 below was taken from the SANBI biodiversity GIS mapping tool and shows the national rivers, river catchments and wetlands in blue. There is a small river running through the centre of the study area with a number of small wetlands across the area, these water features will attract bat activity for drinking purposes and for foraging on insect prey around the water sources.

The mapping tool also shows the National Protected Area Expansion Strategy (NPAES) in orange grids. The goal of the National Protected Area Expansion Strategy (NPAES) is to achieve cost-effective protected area expansion for ecological sustainability and increased resilience to climate change. It sets targets for protected area expansion, and identifies the most important areas for protected area expansion. The study area encompasses an area important for the NPAES. An area is considered important for the expansion of the protected area network if it contributes to meeting biodiversity thresholds for terrestrial or freshwater ecosystems, maintaining ecological processes or climate change resilience.

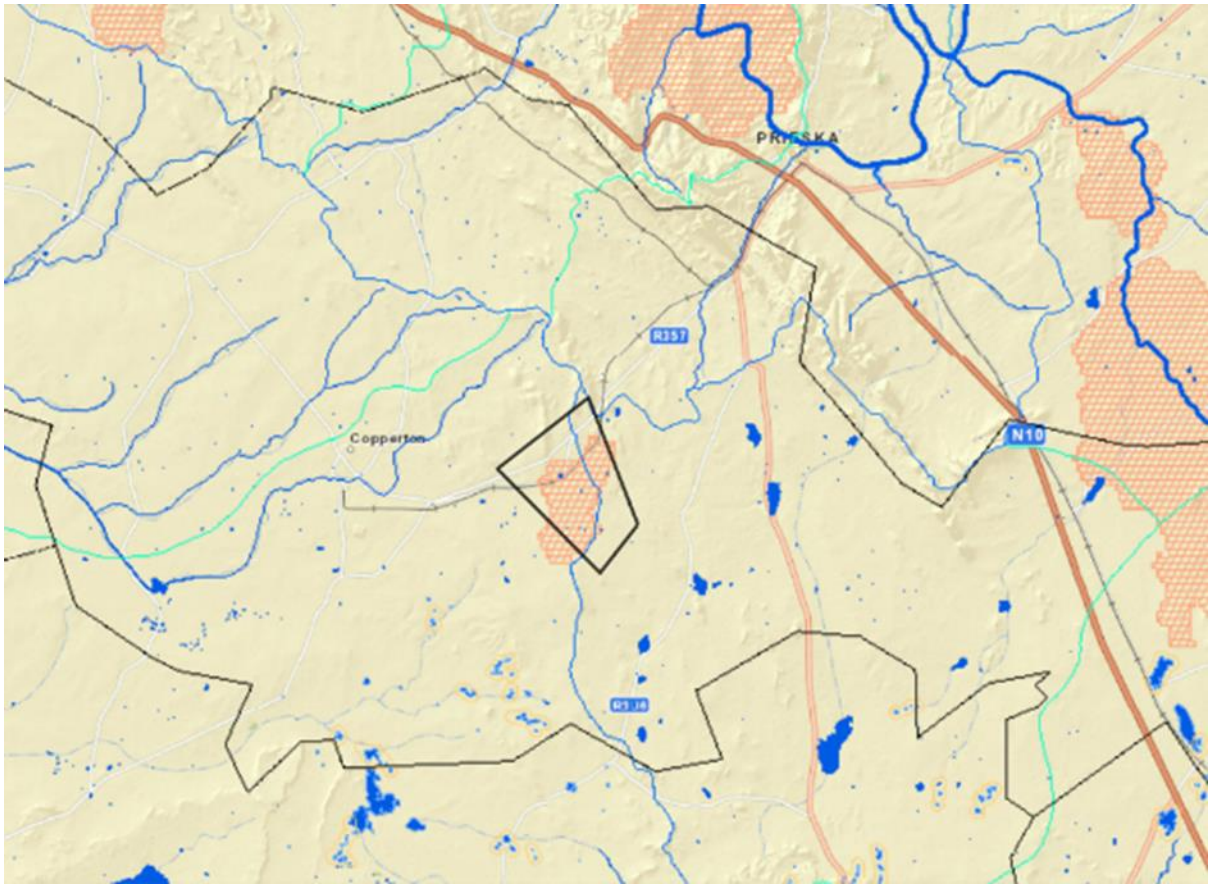


Figure 21: Map indicating national rivers and wetlands (blue features), and NPAES (orange grids)

5.9.3 Literature Based Species Probability of Occurrence

"Probability of Occurrence" is assigned based on consideration of the presence of roosting sites and foraging habitats on the site, compared to literature described preferences. The column of "Likely risk of impact" describes the likelihood of risk of fatality from direct collision or barotrauma with wind turbine blades for each bat species. The risk was assigned by Sowler and Stoffberg (2014) based on species distributions, altitudes at which they fly and distances they traverse; and assumes a 100% probability of occurrence. The ecology of most applicable bat species recorded in the vicinity of the site is discussed below.

Table 14: Table of species that may be roosting or foraging in the study area and the possible site specific roosts (Monadjem et al. 2010).

Species	Common name	Probability of occurrence (%)	Conservation status	Possible roosting habitat on site	Possible foraging habitat utilised on site	Likelihood of risk of fatality (Sowler & Stoffberg, 2014)
Rhinolophus clivosus	Geoffroy's horseshoe bat	10 - 20	Least Concern	Roosts in caves, mine adits and hollows (man-made and natural).	It is associated with a variety of habitats including arid savanna, woodland and riparian forest. Clutter forager that may only possibly be found in denser drainage systems. Relatively small foraging range	Low
Nycteris thebaica	Egyptian slit-faced bat	10 - 20	Least Concern	Roosts in caves, aardvark burrows, culverts under roads and the trunks of large trees and hollows (man-made or natural). Roosting space unlikely on site.	It appears to occur throughout the savanna and karoo biomes, but avoids open grasslands. May be found in denser drainage systems. Relatively small foraging range and an open space forager	Low
Sauromys petrophilus	Roberts's flat-headed bat	60 - 70	Least Concern	Roosts in narrow cracks and under slabs of exfoliating rock. Closely associated with rocky habitats in dry woodland, mountain fynbos or arid scrub.	Open space forager with relatively large foraging range.	High
Tadarida aegyptiaca	Egyptian free-tailed bat	Confirmed	Least Concern	Roost during the day, rock crevices, under exfoliating rocks, in hollow trees, and behind the bark of dead trees. The species has also taken to roosting in buildings, in particular	It forages over a wide range of habitats; its preferences of foraging habitat seem independent of vegetation. It seems to forage in all types of natural and urbanised habitats with a relatively large foraging range. Open space forager	High

Species	Common name	Probability of occurrence (%)	Conservation status	Possible roosting habitat on site	Possible foraging habitat utilised on site	Likelihood of risk of fatality (Sowler & Stoffberg, 2014)
				roofs of houses. The farm buildings are the most likely roosting space.		
Miniopterus natalensis	Natal long-fingered bat	Confirmed (in very low numbers)	Near Threatened	It is cave/mine dependent and hence the availability of suitable roosting sites is a critical factor in determining its presence. It may be found in the Copperton copper mines. Have been found roosting singly or in small groups inside culverts and manmade hollows.	Forages around the edge of clutters of vegetation, and may therefore avoid most of the site and may only be found at the denser drainage systems. It is also dependant on open surface water sources.	Medium - High
Cistugo seabrae	Angolan wing-gland bat	40 - 50	Near Threatened	It is restricted to the arid western parts of southern Africa, typically in desert and semi-desert conditions. Not a common bat.	Not well known, once netted at a dry stream bed in 2006 close to Vredesvallei.	Not known
Eptesicus hottentotus	Long-tailed serotine	30 - 40	Least Concern	It is a crevice dweller roosting in rock crevices, expansion joints in bridges and road culverts	It seems to prefer woodland habitats, but has been caught in granitic hills and near rocky outcrops. Clutter edge forager	Medium
Myotis tricolor	Temmink's myotis	20 - 30	Least Concern	Roosts gregariously in caves, but have been found roosting singly or in small groups inside culverts and manmade hollows.	It is restricted to areas with suitable caves or hollows, which may explain its absence from flat and featureless terrain; its close association with mountainous areas may	Medium - High

Species	Common name	Probability of occurrence (%)	Conservation status	Possible roosting habitat on site	Possible foraging habitat utilised on site	Likelihood of risk of fatality (Sowler & Stoffberg, 2014)
					therefore be due to its roosting requirements.	
Neoromicia capensis	Cape serotine	Confirmed	Least Concern	Roosts under the bark of trees, at the base of aloe leaves, and inside the roofs of houses. The farm buildings are the most likely roosting space.	It appears to tolerate a wide range of environmental conditions from arid semi-desert areas to montane grasslands, forests, and savannas. Highly adaptable species, but a clutter edge forager limiting its utilisation of the site.	Medium - High

5.9.4 Ecology of bat species that may be largely impacted by the proposed Aletta wind energy facility

There are several bat species in the vicinity of the site that occur commonly in the area. These species are of importance based on their likelihood of being impacted by the proposed wind energy facility, due to high abundances and certain behavioural traits. The relevant species are discussed below.

- *Tadarida aegyptiaca*

The Egyptian Free-tailed Bat, *Tadarida aegyptiaca*, is a Least Concern species as it has a wide distribution and high abundance throughout South Africa, and is part of the Free-tailed bat family (Molossidae). It occurs from the Western Cape of South Africa, north through to Namibia and southern Angola; and through Zimbabwe to central and northern Mozambique (Monadjem et al. 2010). This species is protected by national legislation in South Africa (ACR 2010).

They roost communally in small (dozens) to medium-sized (hundreds) groups in caves, rock crevices, under exfoliating rocks, in hollow trees and behind the bark of dead trees. *Tadarida aegyptiaca* has also adapted to roosting in buildings, in particular roofs of houses (Monadjem et al. 2010). Thus man-made structures and large trees on the site would be important roosts for this species.

Tadarida aegyptiaca forages over a wide range of habitats, flying above the vegetation canopy. It appears that the vegetation has little influence on foraging behaviour as the species forages over desert, semi-arid scrub, savanna, grassland and agricultural lands. Its presence is strongly associated with permanent water bodies due to concentrated densities of insect prey (Monadjem et al. 2010).

The Egyptian Free-tailed bat is considered to have a High likelihood of risk of fatality due to wind turbines (Sowler and Stoffberg 2014). Due to the high abundance and widespread distribution of this species, high mortality rates due to wind turbines would be a cause of concern as these species have more significant ecological roles than the rarer bat species.

After a gestation of four months, a single young is born, usually in November or December, when females give birth once a year. In males, spermatogenesis occurs from February to July and mating occurs in August. Maternity colonies are apparently established by females in November.

- *Neoromicia capensis*

Neoromicia capensis is commonly called the Cape serotine and has a conservation status of Least Concern as it is found in high numbers and is widespread over much of Sub-Saharan Africa.

High mortality rates of this species due to wind turbines would be a cause of concern as *N. capensis* is abundant and widespread and as such has a more significant role to play within the local ecosystem than the rarer bat species. They do not undertake migrations and thus are considered residents of the study area.

It roosts individually or in small groups of two to three bats in a variety of shelters, such as under the bark of trees, at the base of aloe leaves, and under the roofs of houses. They will use most man-made structures as day roosts which can be found throughout the study area and surrounding areas (Monadjem et al. 2010).

They are tolerant of a wide range of environmental conditions as they survive and prosper within arid semi-desert areas to montane grasslands, forests, and savannas; indicating that they may occupy several habitat types across the site, and are amenable towards habitat changes. They are however clutter-edge foragers, meaning they prefer to hunt on the edge of vegetation clutter mostly, but can occasionally forage in open spaces. They are thought to have a Medium-High likelihood of risk of fatality due to wind turbines (Sowler and Stoffberg 2014).

Mating takes place from the end of March until the beginning of April. Spermatozoa are stored in the uterine horns of the female from April until August, when ovulation and fertilisation occurs. They give birth to twins during late October and November but single pups, triplets and quadruplets have also been recorded (van der Merwe 1994 and Lynch 1989).

- *Miniopterus natalensis*

Miniopterus natalensis, also commonly referred to as the Natal long-fingered bat and occurs widely across the country but mostly within the southern and eastern regions and is listed as Near Threatened (Monadjem et al. 2010).

This bat is a cave-dependent species and identification of suitable roosting sites may be more important in determining its presence in an area than the presence of surrounding vegetation. It occurs in large numbers when roosting in caves with approximately 260000 bats observed making seasonal use of the De Hoop Guano Cave in the Western Cape, South Africa. Culverts and mines have also been observed as roosting sites for either single bats or small colonies. Separate roosting sites are used for winter hibernation activities and summer maternity behaviour, with the winter hibernacula generally occurring at higher altitudes in more temperate areas and the summer hibernacula occurring at lower altitudes in warmer areas of the country (Monadjem et al. 2010).

Mating and fertilisation usually occur during March and April and is followed by a period of delayed implantation until July/August. Birth of a single pup usually occurs between October and December as the females congregate at maternity roosts (Monadjem et al. 2010 & Van Der Merwe 1979).

The Natal long-fingered bat undertakes short migratory journeys between hibernaculum and maternity roosts. Due to this migratory behaviour, they are considered to be at high risk of fatality from wind turbines if a wind farm is placed within a migratory path (Sowler and Stoffberg 2014). The mass movement of bats during migratory periods could result in mass casualties if wind turbines are positioned over a mass migratory route and such turbines are not effectively mitigated. Very little is known about the migratory behaviour and paths of M. natalensis in South Africa with migration distances exceeding 150 kilometres. If the site is located within a migratory path the bat detection systems will detect if there are high numbers of this species and whether it is a migratory event or high activity period. This will be examined over the course of the 12-month monitoring survey.

A study by Vincent et al. (2011) on the activity and foraging habitats of Miniopteridae found that the individual home ranges of lactating females were significantly larger than that of pregnant females. It was also found that the bats predominately made use of urban areas (54%) followed by open areas (19.8%), woodlands (15.5%) orchards and parks (9.1%) and water bodies (1.5%) when selecting habitats. Foraging areas were also investigated with the majority again occurring in urban areas (46%). However, a lot of foraging also occurred in woodland areas (22%), crop and vineyard areas (8%), pastures, meadows and scrubland (4%) and water bodies (4%).

Sowler and Stoffberg (2014) advise that *M. natalensis* faces a medium to high risk of fatality due to wind turbines. This evaluation was based on broad ecological features and excluded migratory information.

5.9.5 Active Monitoring Results

Table 15 and **Table 16** below display the sampling effort and weather conditions experienced over the time of transects for both site visits

Table 15: The distance and time frames over which transects were carried out

Date	Distance Travelled (km)	Duration	Start	End
22 July 2015	45.1	3 hrs 14 min	17:55	21:09
23 July 2015	55	3 hrs 50 min	18:00	21:50
20 October 2015	62.2	3 hrs 28 min	18:27	21:56
21 October 2015	51.9	3 hrs 24 min	18:10	21:35
22 October 2015	75.4	5 hrs 29 min	17:52	22:47

Table 16: Average weather conditions experienced during transect nights (Taken from www.worldweatheronline.com for Prieska, Northern Cape)

Date	Temperature (°C)	Wind (m/s)	Humidity (%)	Rain (mm)
22 July 2015	15	6 N	63	0.6
23 July 2015	12	5 WSW	63	0.0
20 October 2015	28	5 WSW	27	0.0
21 October 2015	30	5 SSW	50	0.0
22 October 2015	25	5 ESE	28	0.0

Figure 22 and **Figure 23**below display the locations and species of bat passes that were detected across the site during transects.

Transect tracks

Figure 22: Results of active monitoring transects performed in July 2105

No bat passes were detected over the duration of transects of the July 2015 site visit, this is most likely due to the colder weather conditions and rain of the night of 22 July 2015. Bat activity generally declines over the winter season due to greater energy expenditure requirements in harsher weather, as well as the decline in easily available insect prey.

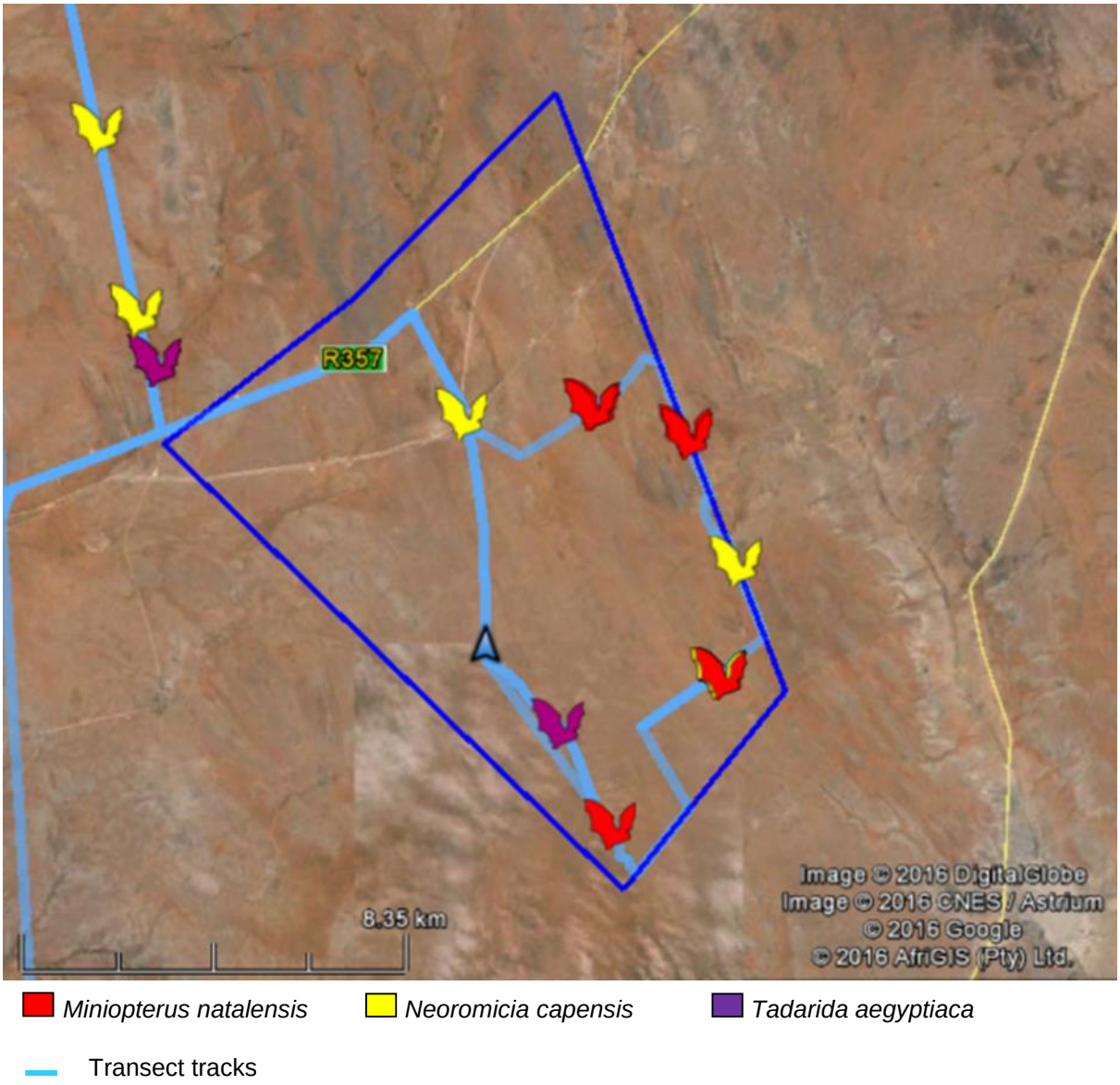


Figure 23: Bat passes detected during active monitoring transects over October 2015

Several bat passes of three different bat species; *Neoromicia capensis, Tadarida aegyptiaca* and *Eptesicus hottentotus*; were detected across the Aletta study area during the transects of October 2015. This season was more favourable for bat activity than winter. The distribution of bat passes across the study area has been factored into the compilation of the bat sensitivity map.

5.9.6 Passive Monitoring Results

The results of bat activity data collected by the passive monitoring systems will be presented in the progress reports of the 12-month Preconstruction Bat Monitoring Study.

5.9.7 Sensitivity Map

Figure 24 depicts the sensitive areas of the study area, based on features identified to be important for foraging and roosting of the species. Thus the sensitivity map is based on species ecology and habitat preferences. This map can be used as a tool to improve turbine placement with regards to bat preferred habitats in the study area.

Table 6: Description of parameters used in the construction of a sensitivity map

High sensitivity buffer	250m
Moderate sensitivity buffer	100m
Features used to develop the sensitivity map	Manmade structures, such as houses, barns, sheds and road culverts, these structures provide easily accessible roosting sites.
	The presence of probable hollows/overhangs, rock faces, mountainous rocky areas and clumps of larger woody plants. These features provide natural roosting spaces and tend to attract insect prey.
	The different vegetation types and presence of riparian/water drainage habitat is used as indicators of probable foraging areas.
	Open water sources, be it man-made farm dams or natural streams and wetlands, are important sources of drinking water and provide habitat that host insect prey.
	Areas frequented often by cattle and livestock (e.g. congregation areas and kraal areas) were assigned a moderate sensitivity since large groups of animals tend to attract insects.

Table 7: Description of sensitivity categories utilised in the sensitivity map

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

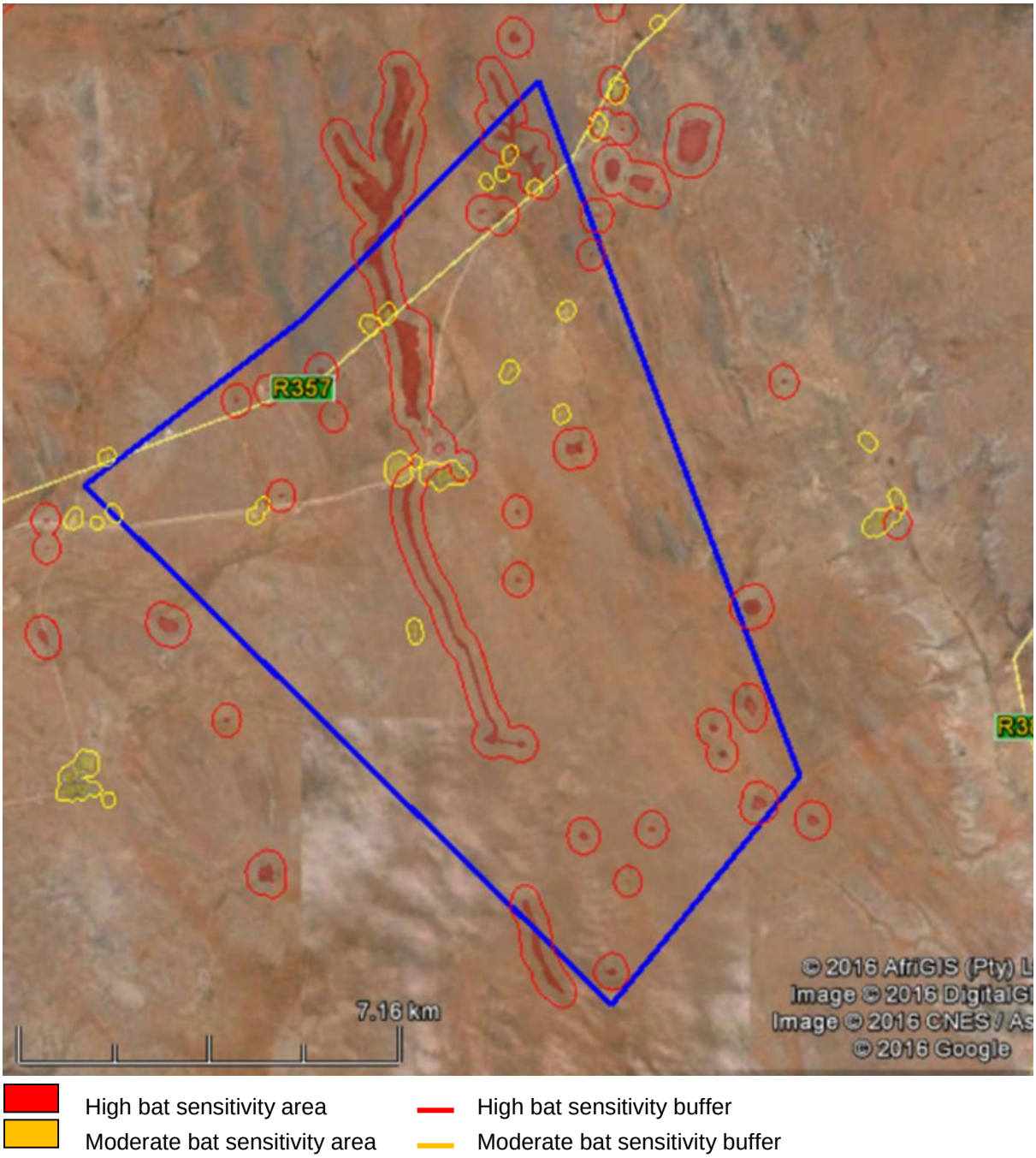


Figure 24: Bat sensitivity map of the Aletta wind energy facility study area

5.10 Surface Water

The Surface Water Assessment was conducted by Shaun Taylor of SiVEST. The full report is included in Appendix 6D. The environmental baseline from a surface water perspective is presented below.

5.10.1 Database Identified Surface Water Resource Occurrence

Database identified surface water resources occurring directly within the proposed Aletta Wind Farm site are provided in **Figure 25** below. In terms of the National ENPAT (2000) database, the proposed development can be found within the Lower Orange Water Management Area. Moreover, the proposed development is within the Orange Primary Catchment. At a finer level of detail, the Aletta Wind Farm site traverses two quaternary catchments including D54D and D62H. The north east boundary of the proposed development site can be found along the boundary of quaternary catchment D72A.

Of the surface water resources identifiable, two non-perennial watercourses can be found on the proposed development site according to the SANBI (2007) database. No other watercourses were identified from the NFEPA (2011) database.

Wetlands were identifiable from the SANBI (2007) database and NFEPA (2011) database. The SANBI (2007) database identifies only one pan wetland, whereas the NFEPA (2011) database identifies eleven depression wetlands. No other surface water resources were identifiable from the available databases.

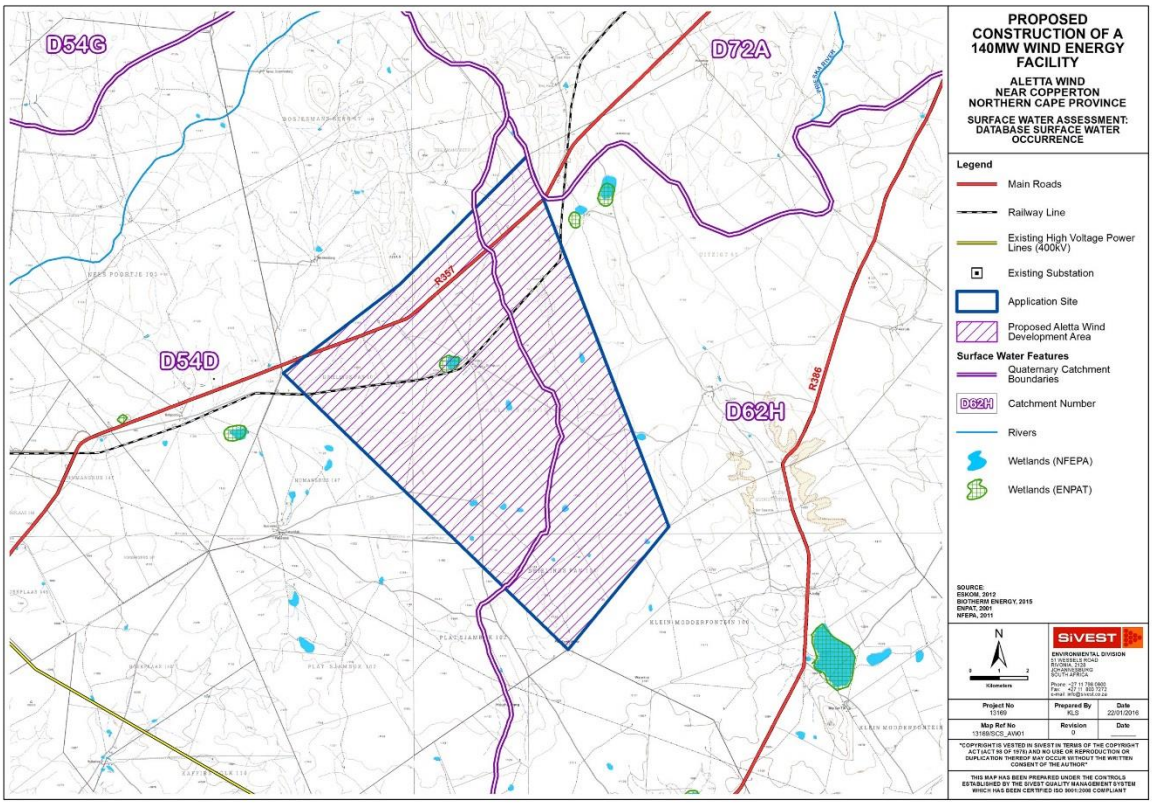


Figure 25: Database Surface Water Resources Occurrence Map

5.10.2 Desktop Surface Water Resource Occurrence

Utilising the database findings above, Google™ satellite imagery overlaid with 1:50 000 topographical images were consulted to refine/confirm surface water resources that were identified as well as to identify any possible additional surface water resources not contained in the databases. The findings for the proposed development site are shown in **Figure 26** and elaborated on below.

From a desktop perspective, ten watercourses (drainage lines) were delineated at a desktop level. Only one of the corresponding database identified watercourses correlate with the desktop delineated watercourses, the other could not be identified and was therefore excluded. However, a number of other watercourses were identified and delineated accordingly at a desktop level. Due to discrepancies, these findings should therefore be reconciled following groundtruthing and delineation in the field.

In terms of wetlands, twenty six depression wetlands and one man-made impoundment were identified and delineated at a desktop level. All database wetlands correspond with the desktop delineated wetlands. Additional wetlands were however identified and delineated accordingly. All wetlands identified at a desktop level were confirmed as depression wetlands with the exception of the man-made impoundment, as identified in the databases.

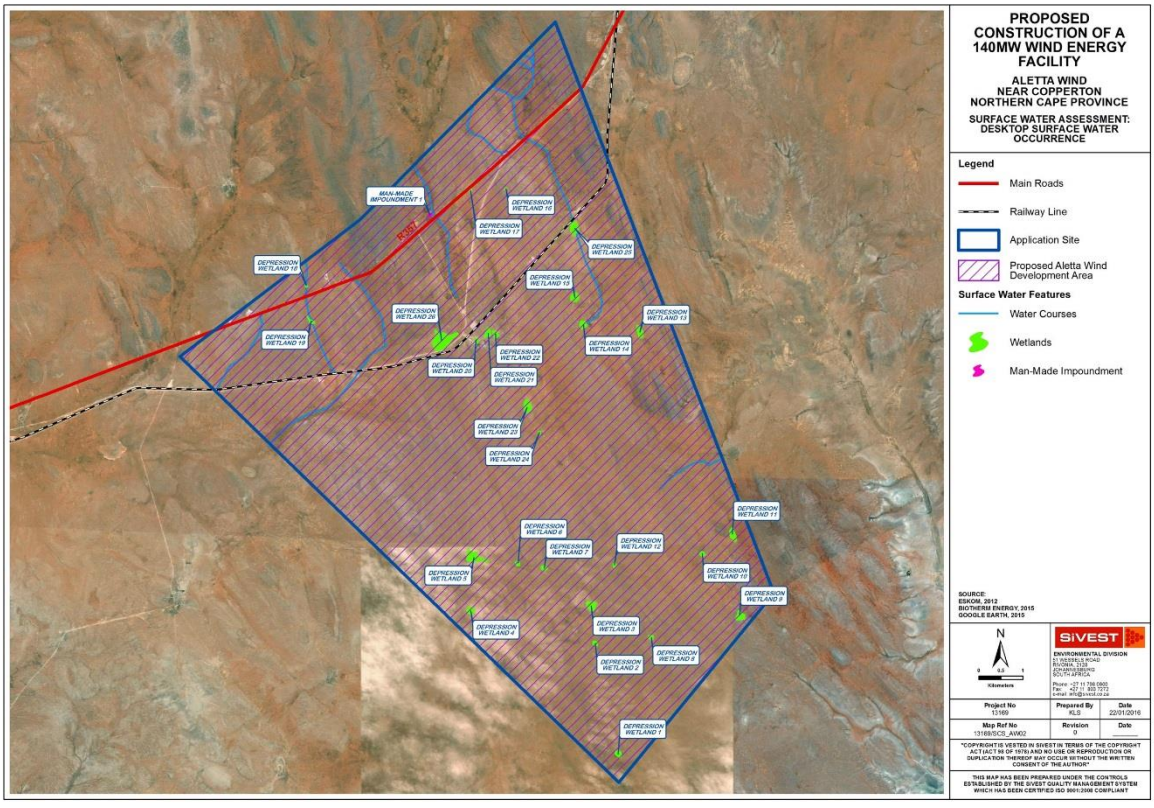


Figure 26: Desktop Surface Water Resources Occurrence Map

5.11 Soils and Agricultural Potential

The Soils and Agricultural Potential Assessment was conducted by D.G. Paterson. The full report is included in Appendix 6E. The environmental baseline from a soils and agricultural perspective is presented below.

5.11.1 Soils

Existing soil information was obtained from the map sheets 2922 Prieska and 3022 Britstown (Bruce & Geers, 2005) from the national Land Type Survey, published at 1:250 000 scale. A land type is defined as an area with a uniform terrain type, macroclimate and broad soil pattern. The soils are classified according to MacVicar et al (1977).

The area under investigation is covered by five land types, as shown on the map in **Figure 27**, namely:

- **Ag137, Ag138, Ag154, Ag158** (Shallow, red, freely-drained soils, high base status)
- **Ic50** (Very rocky areas with little or no soil)

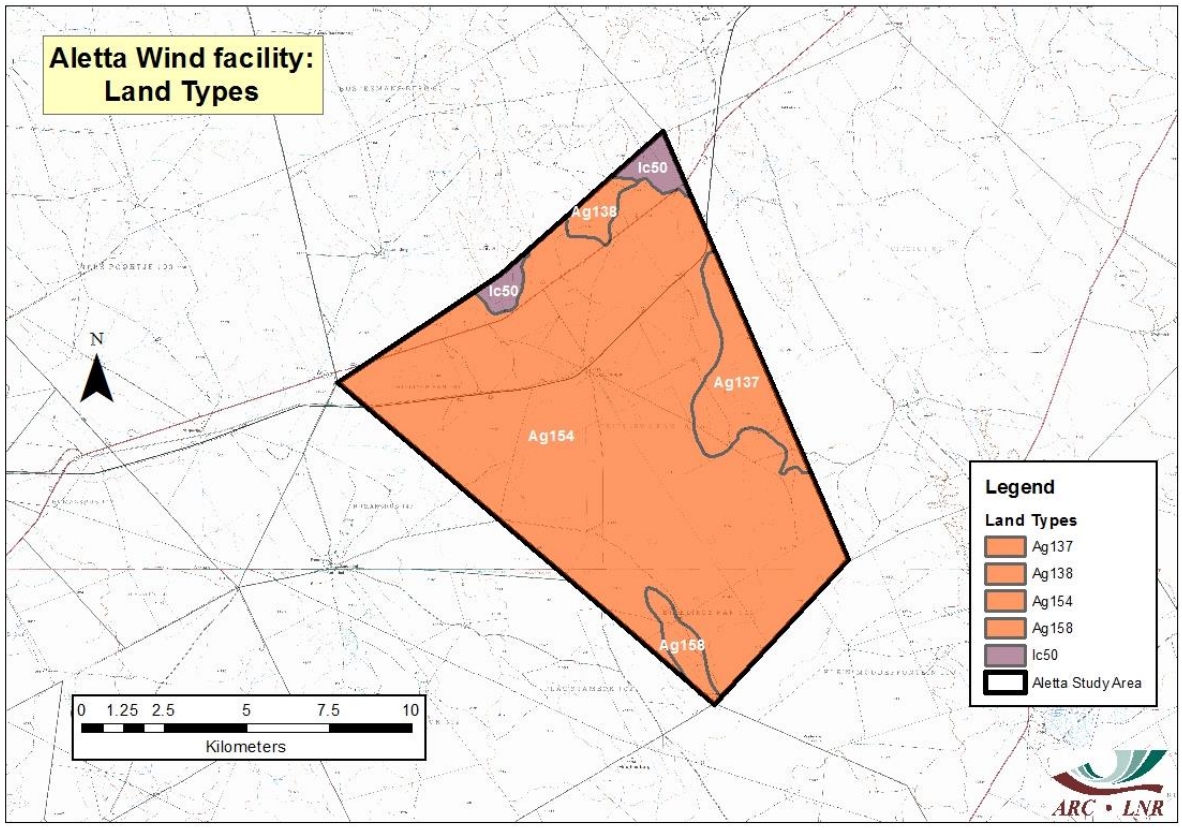


Figure 27: Land types on the proposed project site

It should be clearly noted that, since the information contained in the land type survey is of a reconnaissance nature, only the general dominance of the soils in the landscape can be given, and not

the actual areas of occurrence within a specific land type. Also, other soils that were not identified due to the scale of the survey may also occur. The site was not visited during the course of this study, and so the detailed composition of the specific land types has not been ground-truthed.

A summary of the dominant soil characteristics of each land type is given in **Table 17** below.

The distribution of soils with high, medium and low agricultural potential within each land type is also given, with the dominant class shown in bold type.

5.11.2 Soil Pattern

The soils are all shallow to very shallow (<500 mm), usually sandy and calcareous, overlying either rock or cemented hardpan calcrete. Some rock outcrops occur in places in the landscape. The occurrence and distribution of the land types is shown in the **Figure 27**. A summary of the dominant soil characteristics is given in **Table 17** below.

Table 17: Land types occurring (with soils in order of dominance)

Land Type	Depth (mm)	Dominant soils	Percent of land type	Characteristics	Agric. Potential* (%)
Ag137	20-300	Hutton 34/36/44/46	37%	Red, sandy/loamy soils on rock or hardpan calcrete	High: 0.0
	10-100	Mispah 10/20/22	27%	Red-brown, sandy topsoils, on rock or hardpan calcrete	Mod: 8.1
	-	Rock	23%	Surface rock outcrops	Low: 91.9
Ag138	50-300	Hutton 34/36	32%	Red, sandy/loamy soils on rock or hardpan calcrete	High: 0.0
	500-800	Hutton 34/36/44/46	24%	Red, sandy/loamy soils on rock or hardpan calcrete	Mod: 26.6
	50-300	Hutton 44/46	22%	Red, sandy/loamy soils on rock or hardpan calcrete	Low: 73.4
Ag154	50-300	Hutton 33/34/43	39%	Red, sandy/loamy soils on rock or hardpan calcrete	High: 0.0
	350-650	Hutton 33/34/43	24%	Red, sandy/loamy soils on rock or hardpan calcrete	Mod: 0.0
	50-300	Mispah 10/Glenrosa 23	14%	Red-brown, sandy topsoils on rock or hardpan calcrete	Low: 100
Ag158	-	Rock	45%	Surface rock outcrops	High: 0.0
	50-300	Hutton 33/43	41%	Red, sandy/loamy soils on rock or hardpan calcrete	Mod: 0.0

	25-100	Mispah 10/20	14%	Red-brown, sandy topsoils, on rock or hardpan calcrete	Low: 100
Ic50	-	Rock	45%	Surface rock outcrops	High: 0.0
	25-250	Mispah 10	8%	Red-brown, sandy topsoils, on rock or hardpan calcrete	Mod: 0.0
	25-600	Hutton 34/36	8%	Red, sandy/loamy soils on rock or hardpan calcrete	Low: 100

*Note: Agricultural Potential refers to soil characteristics only, without potentially restricting climatic factors

5.11.3 Agricultural Potential

Virtually all of the study area comprises shallow, often calcareous soils with rock outcrops, as can be seen from the information contained in **Table 17**.

Coupled with these shallow soils, the very low rainfall in the area means that the only means of cultivation would be by irrigation and the Google Earth image of the area (**Figure 28**) shows absolutely no signs of any agricultural infrastructure and certainly none of irrigation.

Figure 28: Google Earth image of the study area

The climatic restrictions mean that this part of the Northern Cape is suited at best for grazing and here the grazing capacity is low, around 20 ha/large stock unit (ARC-ISCW, 2004).

The land use in the area is dominantly “shrubland and low fynbos” with some small areas of “bare rock and soil (natural)” as classified by the National Land Cover (Thompson, 1999). As previously mentioned, there are no areas of cultivation that were identified, only a few small, isolated areas of “Improved grassland”.

5.12 Noise

The Noise Assessment was conducted by Adrian Jongens of Jongens Keet Associates. The full report is included in Appendix 6F. The environmental baseline from a noise perspective is presented below.

Figure 29 displays an aerial view of the Aletta site and surrounding land. The area is rural with several noise sensitive receptors, namely, residential dwellings identified that could potentially be affected by noise emitted by the wind energy turbines.

The proposed wind energy facility site is outlined in dark blue with a preliminary layout indicated. Identified noise sensitive residential areas are outlined by a light blue circle. Other than one of the residential areas located within the wind energy facility boundaries, the approximate distances between residential areas and the nearest wind energy facility boundary are included.

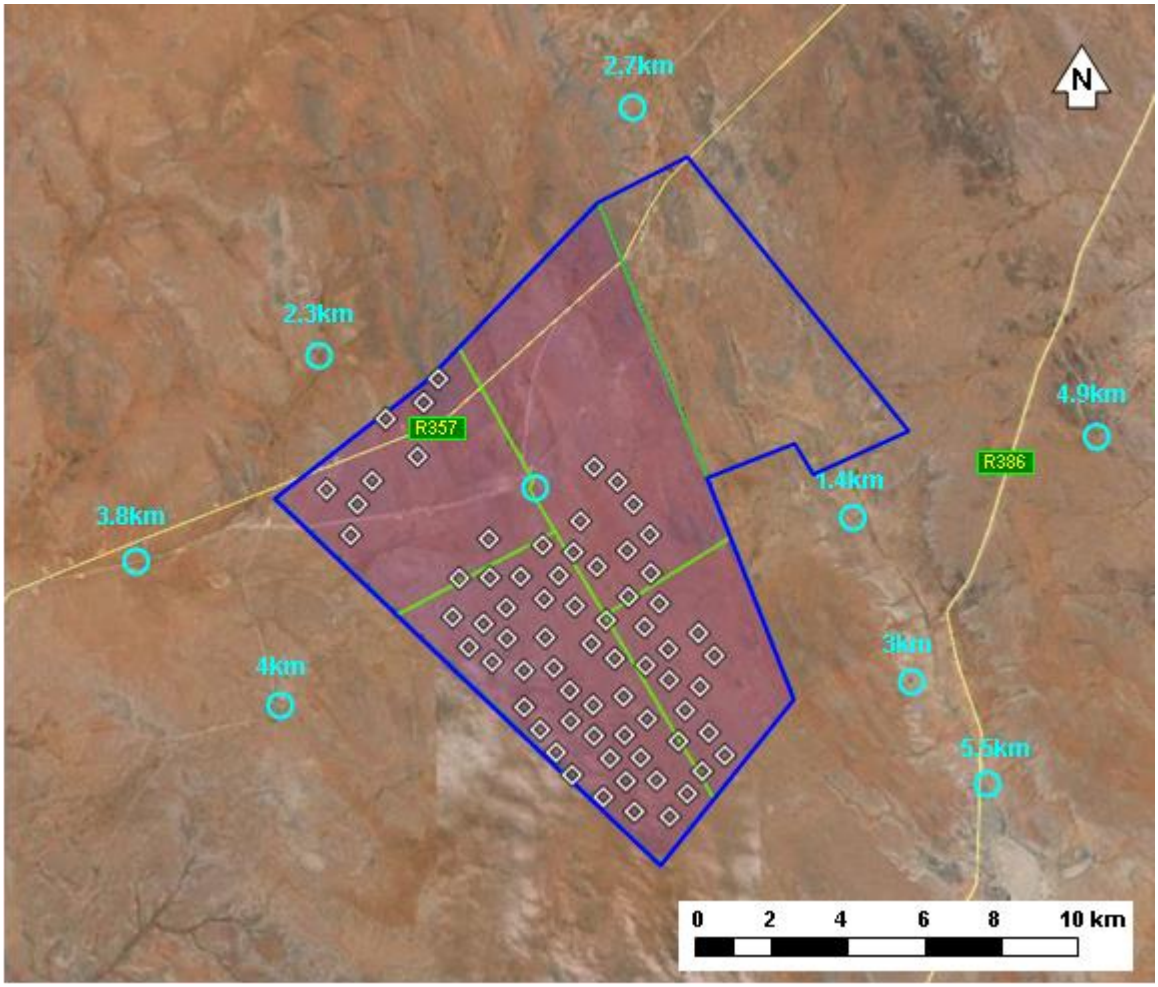


Figure 29: Proposed Aletta wind energy facility with identified noise sensitive receptors

Residual (ambient) sound level measurements were not recorded during the scoping study phase. However, from previous experience it was anticipated that night-time levels would be between 20 and 30 dBA on land far removed from Copperton and the R357.

5.13 Visual

The Visual Assessment was conducted by Stephan Jacobs and Kerry Schwartz at SiVEST. The full report is included in Appendix 6G. The environmental baseline from a visual perspective is presented below.

The physical and land use related characteristics are outlined below as they are important factors contributing to the visibility of a development and visual character of the study area. Defining the visual character is an important part of assessing visual impacts as it establishes the visual baseline or existing visual environment in which the development would be constructed. The visual impact of a development is measured according to this visual baseline by establishing the degree to which the development would contrast or conform with the visual character of the surrounding area. The inherent sensitivity of

the area to visual impacts or visual sensitivity is thereafter determined, based on the visual character, economic importance of the scenic quality of the area, inherent cultural value of the area and presence of visual receptors.

5.13.1 Topography

The largely flat terrain that occurs within the immediate vicinity of the application site results in generally wide-ranging vistas throughout the study area. There are however exceptions to this generally flat topography which include the Dorinberge mountain range located to the north-east of the site, as well as the open hills or ridges located to the north. The Doringberge are situated approximately 24km from the application site and enclose the visual envelope. However, these mountains are located beyond the visual assessment zone and would offer very little topographical shielding/screening to lessen the impact of the wind energy facility from locally-occurring receptor locations. As these hills lie between Prieska and the site, they are a contributing factor in potentially shielding Prieska from the proposed development, although Prieska is situated at a distance from where the impact of the development is likely to be negligible.

5.13.2 Vegetation

The natural short scrub-like vegetation cover which dominates most of the application site and visual assessment zone is not expected to offer any significant visual screening. Sections of the visual assessment zone are however characterised by relatively large tree species such as the Black thorn (*Acacia mellifera* subsp. *detinens),* as well as some other low trees. These above-mentioned trees occur naturally in certain areas of the visual assessment zone and are expected to contribute to the overall natural character of the study area as well as provide some form of screening from the proposed development. In addition, tall exotic trees may also effectively screen the proposed development from farmhouses, where these trees occur in close proximity to the farmhouse and are located directly in the way of views toward the development.

5.13.3 Land Use

Sparse human habitation and the predominance of natural vegetation cover across large portions of the study area would give the viewer the general impression of a largely natural rural setting. High levels of human transformation and visual degradation only become evident in the vicinity of Copperton and Prieska Copper Mine, both of which are outside the 8km assessment zone.

The sections within the visual assessment zone characterized by cultivation are however expected to give the surrounding area a more pastoral feel. Only in areas further south-east, south and west respectively (along the R357, R386 and railway line) will the landscape character appear more urban or industrial. The visual impacts associated with the proposed development are expected to be relatively insignificant in these areas that they have been relatively transformed and/or degraded. The infrastructure associated with the Copper Mine is however unlikely to change the visual character of the study area as the relic mine is located outside of the visual assessment zone, has been non-functional for a number of years, and the transformation of the area around the mine is extremely localised. In

addition, town of Copperton is also located outside of the visual assessment zone and is therefore also not expected to change the visual character of the study area.

The influence of the level of human transformation on the visual character of the area is described in more detail below.

5.13.4 Visual Character and Cultural Value

Visual character can be defined based on the level of change or transformation from a completely natural setting, which would represent a natural baseline in which there is little evidence of human transformation of the landscape. Varying degrees of human transformation of a landscape would engender differing visual characteristics to that landscape, with a highly modified urban or industrial landscape being at the opposite end of the scale to a largely natural undisturbed landscape. Visual character is also influenced by the presence of built infrastructure such as buildings, roads and other objects such as electrical infrastructure.

Most of the study area is considered to have a rural or pastoral character as a result of the limited human habitation and associated human infrastructural footprint present within the wider study area. The nature of the predominant land use (livestock farming) has retained the natural vegetation and natural appearance of the landscape. Built infrastructure within the study area is limited to isolated farmhouses, gravel access roads, boundary fences, a slimes dam and a railway line which traverses a section of the application site. As previously mentioned, the infrastructure associated with the Copper Mine is unlikely to change the visual character of the study area as the relic mine is situated outside of the visual assessment zone, has been non-functional for a number of years, and the transformation of the area around the mine is extremely localised. In addition, the town of Copperton is also situated outside the visual assessment zone and is therefore not expected to alter the visual character of the study area.

The relatively low density of human transformation throughout majority of the study area is an important component contributing to the largely natural visual character of the study area. This is important in the context of potential visual impacts associated with the proposed development of a wind energy facility as introducing this type of development could be considered to be a degrading factor in this context.

It should however be noted that several wind and solar energy facilities are proposed within relatively close proximity to the proposed development. These facilities, and their associated infrastructure, typically consist of very large structures which are highly visible. As such, these facilities will significantly alter the visual character and baseline in the study area once constructed resulting in a more industrial-type visual character.

The greater area surrounding the proposed development site is also an important component when assessing visual character. The area can be considered to be typical of a Karoo or “platteland” landscape that would characteristically be encountered across the high-lying dry western and central interior of South Africa. Much of South Africa’s dry Karoo interior consists of wide open, uninhabited spaces sparsely punctuated by widely scattered farmsteads and small towns. Traditionally the Karoo

has been seen by many as a dull, lifeless part of the country that was to be crossed as quickly as possible on route between the major inland centres and the Cape coast, or between the Cape and Namibia. However, in the last couple of decades this has been changing, with the launching of tourism routes within the Karoo, and the promotion of tourism in this little visited, but large part of South Africa. In a context of increasing urbanisation in South Africa's major centres, the Karoo is being marketed as an undisturbed getaway, especially as a stop on a longer journey from the northern parts of South Africa to the Western and Eastern Cape coasts. Examples of this may be found in the relatively recently published "Getaway Guide to Karoo, Namaqualand and Kalahari" (Moseley and Naude-Moseley, 2008). The exposure of the Karoo in the national press during 2011, as part of the debate around the potential for fracking (hydraulic fracturing) mining activities, has brought the natural resources, land use and lifestyle of the Karoo into sharp focus. Many potential objectors stress the need to preserve the environment of the Karoo, as well as preserve the 'Karoo Way of Life', i.e. the stock farming practices which are highly dependent on the use of abstracted ground water (e.g. refer to the Treasure Karoo Action Group website http://treasurethekaroo.co.za/).

The typical Karoo landscape can also be considered a valuable 'cultural landscape' in the South African context. Although the cultural landscape concept is relatively new, it is becoming an increasingly important concept in terms of the preservation and management of rural and urban settings across the world (Breedlove, 2002).

According to the Committee's Operational Guidelines; Cultural Landscapes can fall into three categories (UNESCO: 2005).

i) "a landscape designed and created intentionally by man";
ii) an "organically evolved landscape" which may be a "relict (or fossil) landscape" or a "continuing landscape";
iii) an "associative cultural landscape" which may be valued because of the "religious, artistic or cultural associations of the natural element"

The typical Karoo landscape consisting of wide open plains, and isolated relief, interspersed with isolated farmsteads, windmills and stock holding pens, is an important part of the cultural matrix of the South African environment. The Karoo farmstead is also a representation of how the harsh arid nature of the environment in this part of the country has shaped the predominant land use and economic activity practiced in the area, as well as the patterns of human habitation and interaction. The presence of small Karoo towns, such as Prieska and Copperton, engulfed by an otherwise rural environment, form an integral part of the wider Karoo landscape. As such, the Karoo landscape as it exists today has value as a cultural landscape in the South African context. In the context of the types of cultural landscape listed above, the Karoo cultural landscape would fall into the second category, that of an organically evolved, "continuing" landscape.

The study area, as visible to the viewer, represents a typical Karoo cultural landscape. This is important in the context of potential visual impacts associated with the proposed development of a wind energy facility as introducing this type of development could be considered to be a degrading factor in the context of the natural Karoo character of the study area, as discussed further below.

5.13.5 Visual Sensitivity

Visual Sensitivity can be defined as the inherent sensitivity of an area to potential visual impacts associated with a proposed development. It is based on the physical characteristics of the area (i.e. topography, landform and land cover), spatial distribution of potential receptors, and the likely value judgements of these receptors towards a new development (Oberholzer: 2005). A viewer's perception is usually based on the perceived aesthetic appeal of an area and on the presence of economic activities (such as recreational tourism) which may be based on this aesthetic appeal.

In order to assess the visual sensitivity of the area SiVEST has developed a matrix based on the characteristics of the receiving environment which, according to the Guidelines for Involving Visual and Aesthetic Specialists in the EIA Processes, indicate that visibility and aesthetics are likely to be 'key issues' (Oberholzer: 2005).

Based on the criteria in the matrix (**Table 18**), the visual sensitivity of the area is broken up into a number of categories, as described below:

i) **High** - The introduction of a new development such as a wind energy facility would be likely to be perceived negatively by receptors in this area; it would be considered to be a visual intrusion and may elicit opposition from these receptors

ii) **Moderate** - Presence of receptors, but due to the nature of the existing visual character of the area and likely value judgements of receptors, there would be limited negative perception towards the new development as a source of visual impact.

iii) **Low** - The introduction of a new development would not be perceived to be negative, there would be little opposition or negative perception towards it.

The table below outlines the factors used to rate the visual sensitivity of the study area. The ratings are specific to the visual context of the receiving environment within the study area.

Table 18: Environmental factors used to define visual sensitivity of the study area

FACTORS	RATING									
	1	2	3	4	5	6	7	8	9	10
Pristine / natural character of the environment										
Presence of sensitive visual receptors										
Aesthetic sense of place / scenic visual character										
Value to individuals / society										
Irreplaceability / uniqueness / scarcity value										
Cultural or symbolic meaning										
Scenic resources present in the study area										
Protected / conservation areas in the study area										
Sites of special interest present in the study area										
Economic dependency on scenic quality										
Local jobs created by scenic quality of the area										
International status of the environment										
Provincial / regional status of the environment										

Local status of the environment										
**Scenic quality under threat / at risk of change										

**Any rating above '5' will trigger the need to undertake an assessment of cumulative visual impacts.

Low					Moderate									High
10	20	30	40	50	60	70	80	90	100	110	120	130	140	150

Based on the above factors, the study area is rated as having a low visual sensitivity. This is mainly owing to the relatively uninhabited character of the area as well as the presence of degraded land and anthropogenic elements (such as the R357, R386 and the railway line) which would likely reduce the scenic quality of the area. An important factor contributing to the visual sensitivity of an area is the presence, or absence of visual receptors that may value the aesthetic quality of the landscape and depend on it to produce revenue and create jobs. As described below, a significant amount of sensitive receptors are present in the study area. Although no formal protected areas or leisure / nature-based tourism activities exist within the study area, the area would still be valued as a typical Karoo cultural landscape.

*Several wind and solar energy facilities are proposed within relatively close proximity to the proposed project. As such, an assessment of the cumulative impact that will be experience from each potentially sensitive receptor will be undertaken in the next phase of this study, once the sensitive receptor locations have been confirmed.

5.14 Heritage

The Heritage Assessment was conducted by Wouter Fourie of PGS Heritage. The full report is included in Appendix 6H. The environmental baseline from a heritage perspective is presented below.

The examination of heritage databases, historical data and cartographic resources represents a critical additional tool for locating and identifying heritage resources and in determining the historical and cultural context of the study area. Therefore an Internet literature search was conducted and relevant archaeological and historical texts were also consulted. Relevant topographic maps and satellite imagery were studied.

Researching the SAHRIS online database (http://www.sahra.org.za/sahris), it was determined that a number of other archaeological or historical studies have been performed within the wider vicinity of the study area.

5.14.1 Findings from the studies

- *Palaeontology*

The following map (**Figure 30**) is an extract from the palaeontological desktop study completed by Almond (2013) for the proposed solar project on the farm Bosjesmansberg 67, bordering on the north to the study area. The map indicates the main geological units as:

The main geological units mapped within the study region are:

i. Precambrian basement rocks (igneous / metamorphic): Reddish-brown with dots (Mu) = Uitdraai Formation (Brulpan Group)
ii. Karoo Supergroup sediments: Grey (C-Pd) = Mbizane Formation (Dwyka Group)
iii. Late Caenozoic (Quaternary to Recent) superficial deposits: Pale yellow (Qg) = Gordonia Formation (Kalahari Group)

Almond (2013), indicated that the, "underlain at depth by unfossiliferous Precambrian metasediments as well as by glacial sediments of the Dwyka Group that contain very few fossils (mainly reworked blocks of stromatolitic carbonate). The overlying superficial sediments (alluvium, gravels, aeolian sands, soils etc) are of low to very low palaeontological sensitivity. The impact significance of the solar facility development, including the transmission line options, on local fossil heritage resources is considered to be VERY LOW."

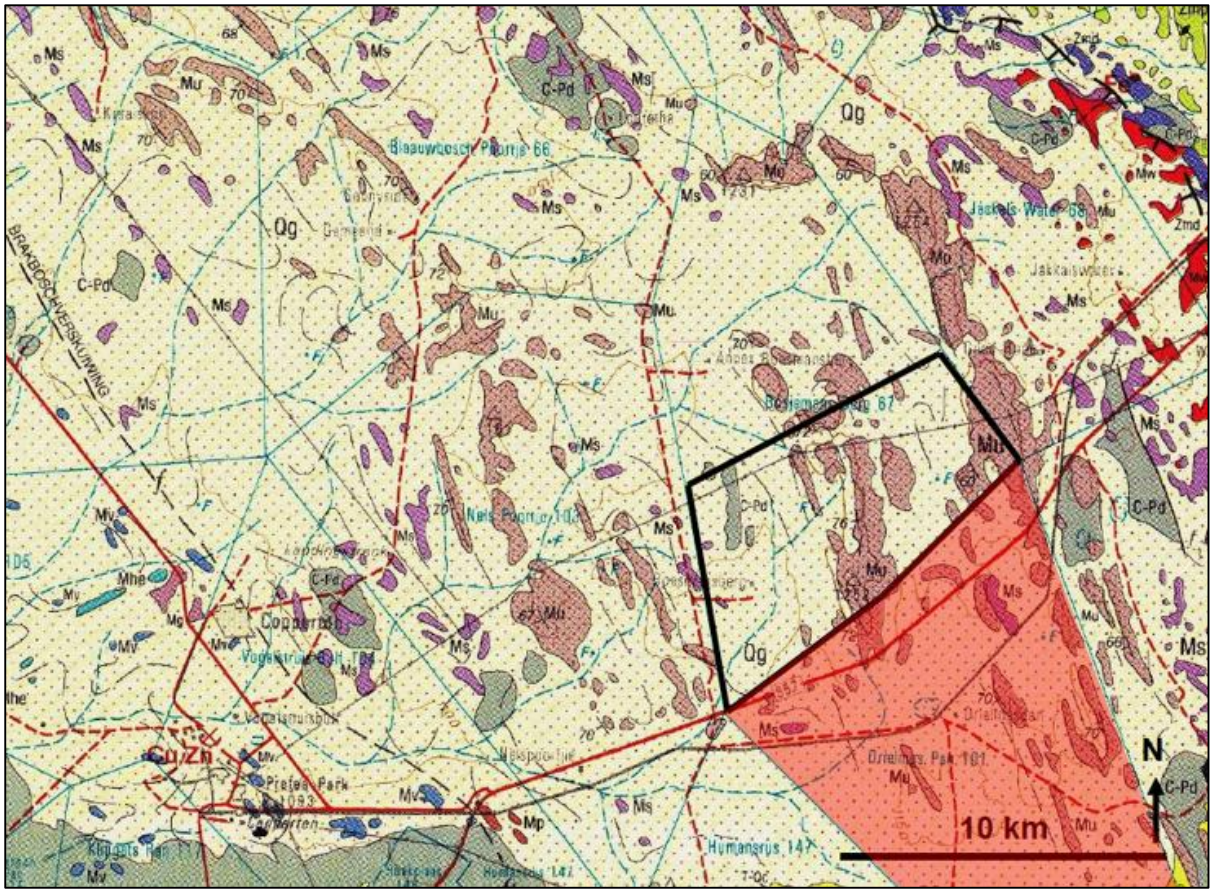


Figure 30: 1: 250 000 geology sheet 3022 Britstown (Council for Geoscience, Pretoria) (Almond, 2013) The Outline of the current study in red

- *Archaeology*

Most archaeological material in the Northern Cape is found near water sources such as rivers, pans and springs, as well as on hills and in rock shelters. Sites usually comprise of open sites where the majority of evidence of human occupation is scatters of stone tools (Parsons 2003). Evaluation of the alignment has identified possible sensitive areas.

The areas marked in blue and red (Figure 33) shows drainage lines and pans in the proposed development areas.

Since September 2011 a large number of Heritage and Archaeological Impact Assessments were completed in the vicinity of the proposed development area (Figure 34). Most notably the work of Orton (2011, 2012 and 2013), Kaplan (2010) and Kaplan and Wiltshire (2011) and Van der Walt (2012), has confirmed the statement by Parsons (2003), as noted earlier.

Figure 31: Early Stone Age stone tools found close to Kronos substation, just west of the study area

Orton (2012) notes that literature has shown that the Bushmanland area is littered by low density lithic scatters, with well weathered Early (ESA) and Middle Stone Age (MSA) artefacts dominating the assemblages. Orton's (2012 and 2013) and Fourie's (2012, 2013, 2015) work on the Klipgats Pan and Hoekplaas, has produced numerous find spots as well as clusters of site located on elevated terraces

overlooking pan-like areas (identified as the drainage area as indicated in Figure 34), noted by Orton as being of LSA origin.

Fourie (2015) notes that findspots were mostly characterised by three types of setting, deflated red sands, and pebble concentrations associated with a calcrete exposure and non-deflated red sand exposures in between low-density vegetation.

The findspots varied from Later Stone Age (LSA) scatters consisting of flakes, chips and some cores manufactured from fine-grained quartzite, chalcedony, and cryptocrystalline (ccs) material; Middle Stones Age (MSA) lithics consisting of cores, chips and flakes with a low occurrence of formal tools. The majority of the material utilised were either lideanite that occur in the form of medium sized boulders or round washed pebbles in the area or coarse-grained quartzite that occur as sporadic outcrops.

Earlier Stone Age (ESA) lithics found at some of these finds spots consisted of hand axes, cleavers and large flakes. Most of the lithics were either rolled or heavily weathered with patination evident on 95% of the lithics.

Figure 32: Close-up view of quartzite flakes and debitage at Kr_Cu/2012/003 (Debitage and lithics indicate by dots) a site situated some 500 meters to the east of the study area (Fourie, 2013)

Kaplan and Wiltshire's (2011) work to the north of the study area has confirmed the presence of Stone Age Sites with a high local significance rating with the sites at Modderpan and Saaipan covering ESA,

MAS and LSA finds. A number of knapping occurrences and find spots were also made during the fieldwork.

Van der Walt (2012) indicates that the fieldwork done for the HIA on Bosjesmansberg, adjacent to the study area has shown a high incidence of low density scatters all over the study area. Wiltshire (2011) indicates the presence of round stone built kraals, close or on low rises that could possibly be associated with herder activity.

5.14.2 Historical structures and history

Some structures identified during map analysis (Figure 33) and needs to be investigated during the Impact Assessment phase.

5.14.3 Heritage sensitivities

The evaluation of the possible heritage resource finds and their heritage significance linked to mitigation requirements was linked to types of landscape. This enabled the development of a heritage sensitivity map (Figure 34). The heritage sensitivity rating does not indicate no-go areas but the possibility of finding heritage significant site that could require mitigation work.

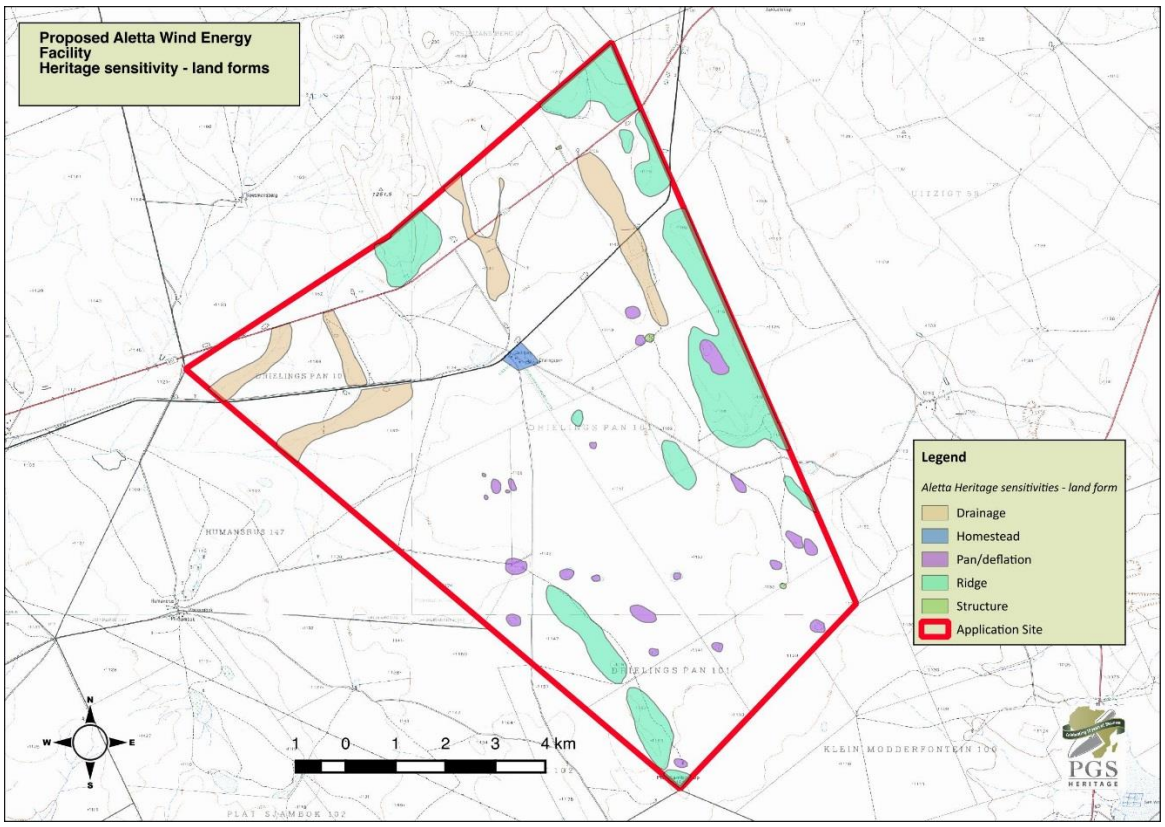


Figure 33: Landforms linked to heritage resources

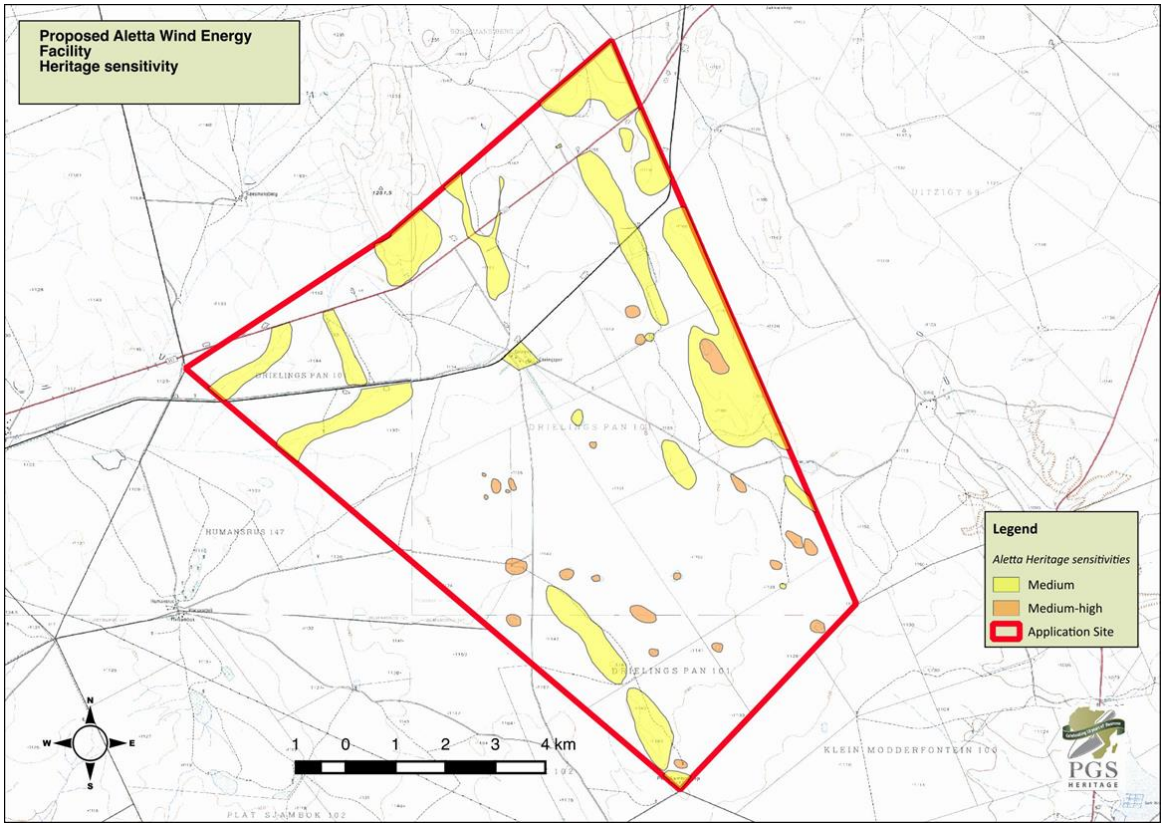


Figure 34: Possible heritage sensitive areas

5.14.4 Possible finds

Evaluation of aerial photography has indicated the following area that may be sensitive from an archaeological perspective (**Figure 34**). The analysis of the studies conducted in the area assisted in the development of the following landform type to heritage find matrix in **Table 19**.

Table 19: Landform to heritage matrix

LAND FROM TYPE	HERITAGE TYPE
Crest and foot hill	LSA and MSA scatters
Crest of small hills	Small LSA sites – scatters of stone artefacts, ostrich eggshell, pottery and beads
Pans	Dense LSA sites
Dunes	Dense LSA sites
Outcrops	Occupation sites dating to LSA
Farmsteads	Historical archaeological material

To be able to compile a heritage management plan to be incorporated into the Environmental Management Plan the following further work will be required for the EIA.

- Archaeological walk through of the areas where the project will be impacting;
- Palaeontological desktop assessment of the areas and selective site visits where required by the palaeontologist;

5.15 Socio-economic Environment

The Socio-economic Assessment was conducted by Ruan Fourie and Elena Broughton of Urban-Econ Development Economists. The full report is included in Appendix 6I. The environmental baseline from a socio-economic perspective is presented below.

This section examines key socio-economic characteristics of the study area. This is essential as it provides both qualitative and quantitative data related to the economies and communities being studied. The outcome is a baseline against which the impacts can be assessed.

5.15.1 Study area's composition and locational factors

- *Spatial context and regional linkages*

The Northern Cape Province is geographically the largest province in South Africa, covering an area of 372 889 km2, which constitutes approximately 30% of the country's total area. Despite having the largest surface area, the Northern Cape Province is the least populated of all nine provinces. According to Census 2011, the Province's population was 1 145 859 or 2.2% of the national population. The Province is bordered by Namibia and Botswana in the north, while domestically, the North West Province borders it in the north-east, the Free State Province in the east, the Eastern Cape Province in the south-east, and the Western Cape Province to the south and south-west. The Northern Cape consists of five districts, namely Frances Baard, Pixley ka Seme, Namakwa, ZF Mgcawu (previously known as Siyanda) and John Taolo Gaetsewe.

The Pixley ka Seme DM, which lies in the south-east of the Northern Cape Province, is geographically the second largest of the five district municipalities in the Province and covers a surface area of 103 410 km². It is bordered by the Free State in the east, the ZF Mgcawu District in the north, the Eastern Cape Province to the south, and the Namakwa District in the west. The total population of the district, according to the 2011 Census, was approximately 186 349, making it the municipality with the second lowest population in the Northern Cape.

The Siyathemba LM is located within the central eastern parts of the Northern Cape Province and is traversed from the east to west by the Orange River, South Africa's largest river. The municipality covers a geographic area of 14 725 km2. Prieska functions as the administrative seat of the local municipality. Other settlements include Marydale, Nierkerkshoop, and Copperton.

Spatially, Siyathemba is very distant from South Africa's largest consumer markets. The nearest major town to the site is Prieska, which has easy access to the main railway line running to Namibia and good tarred road connections to Upington, Kimberly, and De Aar.

- *Towns and Settlements*

Copperton is the town located closest to the proposed project site. It was once populated area that housed nearly 3 000 miners and their families. As a result of the closure of the Copperton Mine, the

population of the town dropped to 55 individuals (33 households) by 2011 (Stats SA, 2015). A few of the unoccupied houses are currently used by Denel SOC Ltd, which operates a missile testing centre in the area (Wikipedia, 2014).

The closest major town to Copperton is Prieska, which is situated approximately 50 km away and is located on the south bank of the Orange River at the foot of the Doringberg. Prieska was originally named Prieskap, a Khoisan word meaning, "lace of the lost she-goat". Prieska is the administrative seat of the Siyathemba LM. It is located on the southern bank of the Orange River and is home to 14 248 people (Stats SA, 2015). While relatively isolated, Prieska has good access to the main railway line leading to Namibia, good tarred road connections to Upington, Kimberley and De Aar, and two landing strips for light aircrafts.

Marydale, situated 60km north-west of Copperton, is a rural service centre. Nierkerkshoop, another rural service centre, is located approximately 80km north-east of Copperton. Both of these settlements are largely underdeveloped and sparsely populated.

- *Locational factors and major tourism attractions*

Copperton can be accessed through the R357 from Prieska, which is a tarred road, as well as various dirt roads that stem from a north-westerly direction near the project site itself. These dirt roads lead to Marydale, but are not suitable for large traffic volumes; most motorists choose the tarred roads leading from Marydale to Prieska and then to Copperton. There are also tarred roads that lead to the military testing facility known as Alkantpan. From the aforementioned, it can be seen that access to the proposed location is limited to very few quality tarred roads and may need to be addressed when considering any further developments in said area.

Generally, the area does not have any significant mineral deposits. To the south of Prieska, on the farm Doornfontein, a medium-sized mineral deposit of Phosphate can be found. Various small mineral deposits can be found near Niekerkshoop. These include Tiger's-eye and Crocidolite (i.e. asbestos). Small deposits of Alluvial Diamonds can be found in the Orange River. Other small mineral deposits within the municipal boundary include Salt, Gypsum, Iron and Uranium (Siyathemba LM, 2014).

The Orange River runs through the municipality and provides ideal conditions for irrigation farming and cultivation of grains and vegetables.

The following are the main tourism attractions in the region (Siyathemba LM, 2014):

- Die Bos Nature Reserve
- British Fort
- Green Valley Nuts
- The Oranjezicht and Keikamspoort Hiking Trails
- Khoisan Rock Art
- Memorial Garden
- Prieska Museum
- Ria Huysamen Aloe Garden Schumann Rock Collection

- Wonderdraai Island

5.15.2 Sense of place, history and cultural aspects

Copperton was once a populated town, providing accommodation for the mine workers and their families during the period from 1970 to the end of the 20th century. It was then sold to a private owner after the closure of the Copperton Mine and is currently on a long-term lease by the Request Trust. Some of the houses were initially demolished, but after the lease agreement was signed with the Request Trust, an agreement was reached that the rest of the houses could be retained and used for accommodation of occasional visitors that may visit the Alkantpan testing facility (Siyathemba LM, 2014).

The preferred language in the Copperton area is Afrikaans, followed by English. The immediate surroundings can be described as a sparsely populated, semi-desert natural region with little to no noise or visual pollution.

Prieska is a far more densely populated area than Copperton, and has its origins in the early 1800's when farmers used it as a place to stay when the nearby dry riverbeds were full. It was administered by a village management board from 1882 and attained municipal status in 1892 (Siyathemba LM, 2016).

The preferred language in the Prieska area is Afrikaans (Stats SA, 2015). The sense of place is again defined as a semi-desert, natural region but more densely populated with small levels of visual and noise pollution. Prieska also has rich heritage and memorial sites that include the Khoisan rock art, the British Fort and the Boss Nature Reserve that are all near the town.

Marydale was established by the Dutch Reformed Church in 1903, and named after the wife of Mr. GP Snyman who owned the farm on which the town was built (Siyathemba LM, 2016). The preferred language in the area is Afrikaans with 96% of the population stating that it is their first language (Stats SA, 2015). The sense of place of the Marydale area and its immediate surroundings can again be defined as a sparsely populated, semi-desert natural region with little to no noise or visual pollution.

Niekerkshoop was laid out on the farm Modderfontein in 1902 as an Asbestos mining centre. The village management board has administered it since 1904 (Siyathemba LM, 2016). The preferred language in the area is Afrikaans, with 95.8% of the population stating that it is their first language (Stats SA, 2015). The sense of place of the Niekerkshoop area and its immediate surroundings can again be defined as a sparsely populated, semi-desert natural region with little to no noise or visual pollution.

5.15.3 Demographic Profile

The population of any geographical area is the cornerstone of the development process, as it affects the economic growth through the provision of labour and entrepreneurial skills, and determines the demand for the production output. Examining population dynamics is essential in gaining an accurate perspective of those who are likely to be affected by any prospective development or project.

- *Population demographics*

The Siyathemba LM is home to approximately 21 593 people, with a total of 5 830 households (Stats SA). The population has increased by 14.9% from 18 376 in 2001. A large portion (87.2%) of the population in the LM resides in urban areas, while the rest (12.8%) lives on farms. Both urban to urban migration and rural to urban migration are relevant in the Pixley ka Seme region, including the Siyathemba LM. Rural to urban migration is perceived as the dominant migration type at present (Pixley ka Seme District Municipality, 2014/15). The large proportion of people living in the urban area can be explained by the ease of access to opportunities and services within the larger urban centres, in this case Prieska. The majority (72.2%) of the people in the municipality are Coloured with 18.5% of the population being Black, followed by White 8.4%), and Indians/Asians (0.5%). Afrikaans is the language most spoken in the LM. The municipality's sex ratios are not very skewed, the female population (50.1%) accounts for slightly more of the LM's population compared to the male population (49.9%).

The youth (age 15-34) make up the majority of the people living in the Siyathemba LM with 31.7%, followed by the group between the ages of 35 and 64 with 31.4%. Considering the working age group that is between the ages of 15 and 64, the municipality has a slightly bigger percentage of working age males than females (**Figure 35**). The population in the area is characterised by a high dependency ratio (58.5%) with a total of 36.8% of the population within the ages of 0 to 14 (30.6%) and over 65 years old (6.2%). According to the district municipality's IDP, the implications of this population structure are a higher demand on the provision of social and physical facilities, like schools, primary health care centres, etc.

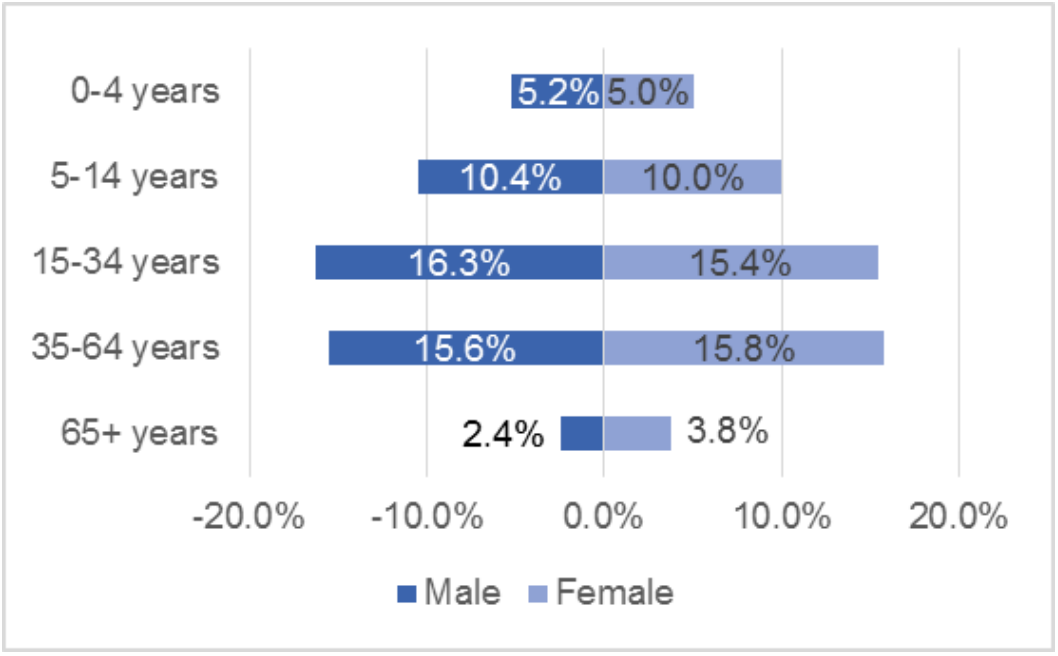


Figure 35: Age and gender profile

- *Health demographics*

The effect that the HIV virus has had on the DM and LM is less profound than in the rest of South Africa and the Northern Cape Province but the number of HIV cases and AIDS related deaths have increased more rapidly in the last 15 years when compared to national and provincial averages.

Table 20: Population, HIV positive, AIDS and other deaths (2015)

Indicator	South Africa	Northern Cape	Pixley ka Seme DM	Siyathemba LM
Population	54 956 509	1 175 780	192 549	22 448
HIV positive	6 248 908	86 146	11 517	1 204
AIDS deaths	206 761	2 360	227	26
Other deaths	444 866	9 729	1 581	186

(Quantec, 2016)

The Siyathemba LM had a reported 1 204 individuals that were HIV positive in 2015, which equates to 5.3% of the total LM population. The percentage is far less than the National and Provincial levels at 11.3% and 7.3% for both provincial and national population, respectively. Total AIDS-related deaths equated to 26 individuals in the LM, or 0.1% of the LM population, which is again below the National and Provincial averages of 0.3% and 0.2% respectively. The AIDS-related LM deaths also equate to 12.2% of total deaths in the LM, which is lower than the national and provincial figures of 31.7% and 19.5%, respectively.

Since the year 2000, the number of people living with the illness has increased from 350 individuals in 2000 to just over 1 200 people in 2015. This indicates a near 250% increase in ten years, which is far more when compared to national and provincial averages (Siyathemba LM, 2014).

- *Crime demographics*

The Siyathemba LM recorded 1 146 cases of serious crimes in 2015 of which 1 052 were reported by the community and 94 identified by police. Assault with the intent to inflict grievous bodily harm was the most common reported crime with 253 cases, followed by common assault with 112 cases and finally burglary at residential premises with 54 cases reported. Furthermore, 53 cases of stock theft were recorded in the LM, which can be attributed to the large number of stock farming occurring in the area. Drug-related cases were less prevalent in the LM, with only 4% of reported cases being drug related. This figure is 5% less than the District figure and 3% less than the provincial figure.

Table 21: Crimes reported by crime type (2015)

Crime types	South Africa	Northern Cape	Pixley ka Seme DM	Siyathemba LM
Serious crimes	**2 209 068**	**57 817**	**9 720**	**1 146**
Community reported crimes	**2 068 261**	**54 724**	**8 952**	**1 052**
Crimes dependent on police action for detection	**140 807**	**3 093**	**768**	**94**

(Quantec, 2016)

5.15.4 Economy

- *Size and contribution of local economy*

In 2013, the Siyathemba LM economy was valued at R 796 million in current prices. The LM contributed 10.9% to the economy of the Pixley ka Seme District and made a contribution of 1.2% to the province's economy.

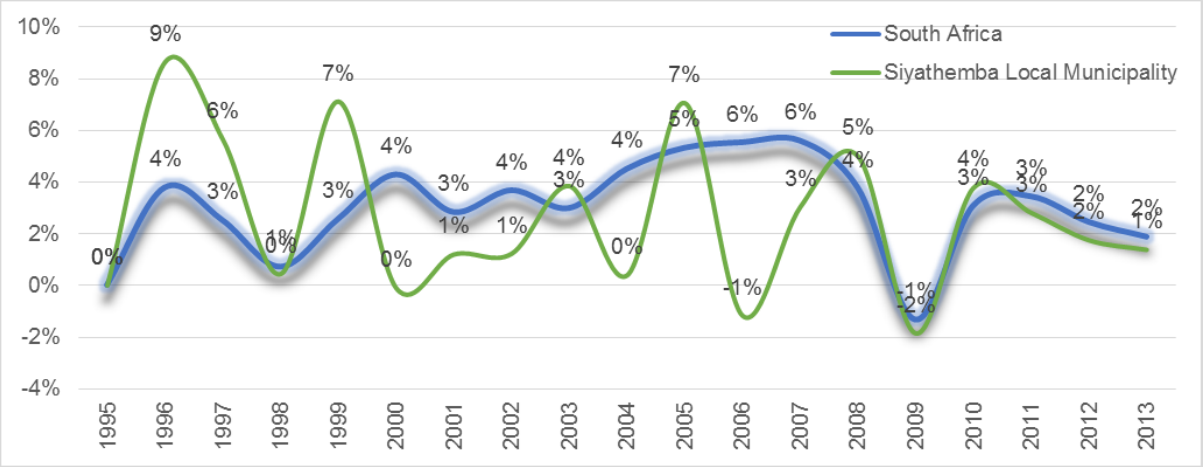


Figure 36: Growth rates for SA and Siyathemba LM (1995 – 2013) (Quantec, 2016)

High dependence of the LM on mining activities in the late 1990's and early 2000's, whilst targeting international commodity markets resulted in the local economy being highly susceptible to economic dynamics globally. **Figure 36** illustrates that the Siyathemba economy is significantly more volatile than that of South Africa. This is largely due to the dependency of the local economy on the global demand for commodities as well as the stability of the industry internally (i.e. from a labour issue perspective).

The mining sector historically played a major role in the local economy, with asbestos and copper mining the key activities. Currently, mining activities are mainly related to alluvial diamond mining activities along the Orange River. The closure of the asbestos mines as well as the Copperton mine has had a major lasting negative impact on the Siyathemba LM economy, reducing the size of the mining industry from R47 million in 2003 to R9 million in 2013.

In 2009, as a result of the financial crisis globally, the economy contracted by 2%, but was able to recover somewhat in the following year. Sectors most heavily affected but the crisis include the wholesale and retail trade as well as the mining sectors.

- *Structure of the economy and dynamics*

The structure of the economy and the composition of its employment provide valuable insight into the dependency of an area on specific sectors and its sensitivity to fluctuations of global and regional markets. Knowledge of the structure and the size of each sector is also important for the economic impact results' interpretation, as it allows the assessment of the extent to which the proposed activity would change the economy, its structure, and trends of specific sectors.

Table 22: The Northern Cape and Siyathemba LM structure of economies (2013)

Economic Sector	Northern Cape (GDP in 2013 prices)			Siyathemba LM (GDP in 2013 prices)		
	GDP (R'ml)	% of GDP	CAGR (2004 - 2013)	GDP (R'ml)	% of GDP	CAGR (2004 - 2013)
Agriculture	3 674	5,4%	2,5%	132	16.7%	6.3%
Mining and quarrying	21 399	31,2%	-1,2%	25	3.1%	-15.3%
Manufacturing	1 676	2,4%	3,7%	29	3.6%	8.0%
Electricity, gas and water	1 708	2,5%	1,0%	18	2.3%	-2.8%
Construction	1 183	1,7%	5,9%	34	4.3%	6.7%
Trade	8 600	12,5%	2,7%	119	14.9%	-0.7%
Transport and communication	5 393	7,9%	3,0%	27	3.4%	-1.8%
Finance and business services	8 406	12,2%	4,4%	178	22.4%	5.2%
Personal services	6 195	9,0%	3,3%	113	14.2%	3.7%
General government	1 0423	15,2%	3,4%	63	15%	2.8%
TOTAL	68 656	100,0%	2,1%	119	100,0%	12%

(Quantec, 2016)

In terms of economic activities, the economy of the Northern Cape Province depends heavily on the primary sectors of the economy (agriculture and mining), which made up 31.2% of GDP-R in 2013. The largest sector is mining, which has been fluctuating between periods of growth and decline in contribution to the GDP-R. Agriculture, on the other hand, has declined in contribution from 8.7% in 2002 to 5.4% in 2013. Over a period of ten years (2003-2013), the LM's economy grew at a Compounded Average Growth Rate (CAGR) of 2.4% per year. This was slightly higher than the district and provincial average growth rates of 1.8% and 2.3%, respectively.

Contrary to the province's economy, mining and quarrying continues to be a small contributor to the economy of the LM, making a meagre 3.1% contribution compared to the province's 31.2%. This is a result of the decline in the mining industry mentioned above, and is further illustrated by a negative CAGR of 15% in the last ten years (see Table 3-3). On the other hand, the agricultural sector makes a significant contribution of 16.7%; making it the second largest single contributor after finance and business services (22.4%).

The agricultural sector has also shown steady growth in the last ten years with a CAGR of 6.3%, while finance and business services showed a 5.2% CAGR for the same period. The most extensively cultivated crops in the municipality are maize, wheat, peanuts, lucerne and table grapes. Stock farming activities are mainly based on sheep and goats. Another sector that has shown noteworthy growth is manufacturing with a CAGR of 8% over the last ten years, which is the highest of all the sectors. It also contributes 4.8% to the LM GDP. Overall, the economy of Siyathemba LM is a service economy with the tertiary sector contributing 70% to the municipality's GDP-R.

5.15.5 Labour Force and Employment Structure

Employment is the primary means by which individuals who are of working age may earn an income that will enable them to provide for their basic needs and improve their standard of living. As such, employment and unemployment rates are important indicators of socio-economic well-being.

- *Labour force composition*

The labour force consists of employed and unemployed persons. The Not Economically Active (NEA) portion of the population includes people that are not working as a result of choice, age or other circumstances. The unemployment rate indicates the percentage of unemployed individuals that form part of the labour force. It does not include discouraged job seekers, though this group of people will also be mentioned later in this section.

The Census 2011 data indicates that the Siyathemba LM had about 13 656 people in the working-age population. This amounts to 63% of the total population. Of these, 7 113 people were economically active, while roughly 48% of the working age population were not economically active (NEA); that is, persons aged 15–64 years who are neither employed nor unemployed at the time of the survey, including discouraged job seekers. The employed labour in the LM was estimated at 5 356, while the unemployed population was estimated at 1 757, reflecting an unemployment rate of 24.7%. This was lower than the country's unemployment rate of 29.7% and lower than the provincial unemployment rate that was recorded at 27.4%.

As indicated in **Table 23**, the town of Prieska had 3 094 of the working age population employed, with 1 212 of them unemployed. This means that 28.1% of the labour force in Prieska was unemployed. On the other hand, 4 672 of the working age population was not economically active. In the smaller towns, the unemployment situation was worse, with unemployment rates of 41% and 33.6% in Marydale and Nierkerkshoop, respectively (Stats SA, 2014). The Copperton community is very small and isolated from employment opportunities and amenities, but shows a 0% unemployment rate that can be attributed to the extremely small labour force and working age population in the area.

Table 23: Labour profile of the Siyathemba LM (2011)

Town/settlement	Working age	Labour force			Discouraged job seekers	Unemployment rate
		Employed	Unemployed	Total		
Copperton	40	16	-	16	7	0%
Marydale	1 507	297	207	504	100	41.1%
Niekerkshoop	1 115	472	239	711	12	33.6%
Prieska	8 978	3 094	1 212	4 306	578	28.1%
Siyathemba NU	1 972	1 463	81	1 544	77	5.2%
Westerberg	44	14	18	32	0	56.3%
TOTAL	155 469	5 356	1 757	7 113	774	164.3%

(Stats SA, 2015)

- *Employment structure*

More than three quarters of the employed individuals in the Siyathemba LM were employed in the formal sector and only 10.8% were employed in the informal sector. Private households provided for 11.8% of the employment opportunities in the municipality.

In Prieska, 76.7% of the employment opportunities were provided by the formal sector, and only 10.8% came from the informal sector (**Figure 37**). In Marydale, 71.4% of the employed population is employed in the formal sector, while only 66.2% of the Nierkerkshoop employment opportunities come from the formal sector. A significant percentage (18.9%) of Nierkerkshoop's employment opportunities come from the informal sector, while the same sector contributes only 15.3% towards employment in Marydale (Stats SA, 2015). Copperton, 73.7% of the employment opportunities were provided by the formal sector with 12.4% coming from the informal sector and 11.5% being private households.

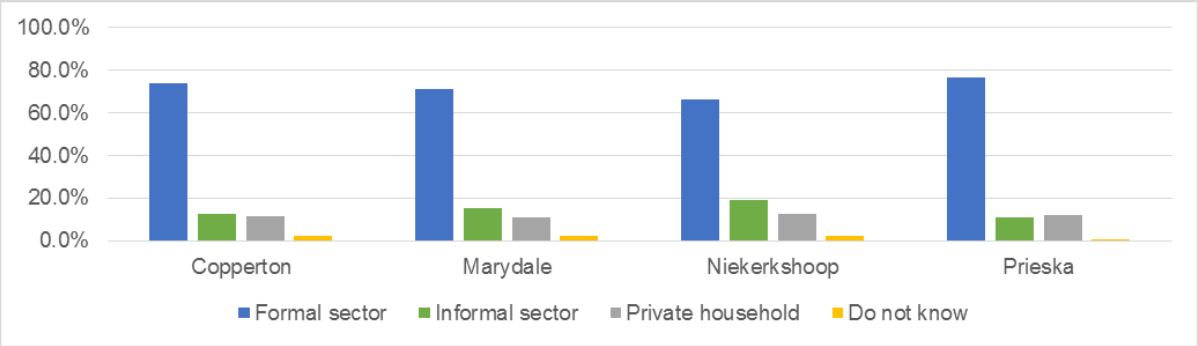


Figure 37: Regional employment by sector (Stats SA, 2015)

The tertiary sector is the largest contributor to formal and informal sector employment with 57.4% of opportunities offered by said sector. This is followed by the Primary sector with 28.3% and the secondary sector with 14.2%. The high tertiary sector figure is somewhat inflated by the community, social and personal services; and the general government industries that make up half of the tertiary sector. Considering the aforementioned, the main contributor to employment becomes the primary sector.

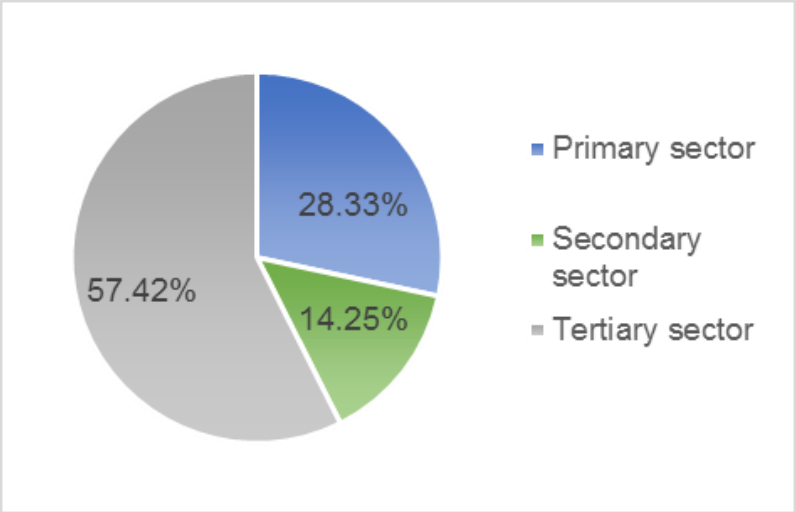


Figure 38: Siyathemba LM sectoral employment (Quantec, 2016).

In terms of the structure of employment, the agricultural sector was the most important economic sector not only in the LM but in the district as well. In the Siyathemba LM, this sector contributed 27.8% of the total employment opportunities, while creating 27.1% of employment opportunities in the Pixley ka Seme District. This was followed by personal services and general government. These figures are almost similar to those of the province but general government is the largest contributor to employment in the Northern Cape Province. **Table 24** below indicates the contribution of economic sectors to employment in the district and the LM.

Table 24: Employment by economic sectors in Pixley ka Seme DM and Siyathemba LM

Economic Sector	Pixley ka Seme DM Employment		Siyathemba LM Employment	
	Employment	%	Employment	%
Agriculture	12 587	27.1%	1 637	27.8%
Mining and quarrying	342	0.7%	32	0.6%
Manufacturing	1 354	2.9%	219	3.7%
Electricity, gas and water	358	0.8%	24	0.4%
Construction	2 813	6.1%	596	10.1%
Trade	6 491	14.0%	774	13.1%
Transport and communication	839	1.8%	50	0.8%
Finance and business services	5 357	11.6%	751	12.8%
Personal services	8 489	18.3%	921	15.6%
General government	7 756	16.7%	888	15.1%
TOTAL	46 387	100%	22 3232	100%

(Quantec, 2016)

Formal sector employment for the LM consists of mainly semi- and unskilled workers with 82.9%, followed by skilled workers with 17.1%. This is in alignment with the district averages that show almost the same figures for each skill level (**Table 25**).

Table 25: Employment by skill level and occupation in Pixley ka Seme and Siyathemba

Skills	Pixley ka Seme DM Employment		Siyathemba LM Employment	
	Employment	%	Employment	%
Skilled	**7 950**	**18.2%**	**923**	**17.1%**
Legislators, senior officers and managers	**2 782**	**6.3%**	**338**	**6.3%**
Professionals	**1 733**	**4%**	**241**	**4.5%**
Technicians and associate professionals	**3 435**	**7.9%**	**344**	**6.4%**
Semi-skilled	**19 734**	**45.1%**	**2 371**	**43.92%**
Clerks	**4 557**	**10.4%**	**395**	**7.3%**
Service workers and shop and market sales workers	**6 103**	**14%**	**775**	**14.4%**
Skilled agricultural and fishery workers	**2 459**	**5.6%**	**309**	**5.7%**
Craft and related trades workers	**4 258**	**9.7%**	**498**	**9.2%**
Plant and machine operators and assemblers	**2 354**	**5.4%**	**394**	**7.3%**
Unskilled	**16 086**	**36.8%**	**2 105**	**39%**
Elementary occupations	**16 086**	**36.8%**	**2 105**	**39%**
TOTAL	**43 770**	**100%**	**5 398**	**100%**

(Stats SA, 2015)

Table 25 illustrates that elementary occupations represent the biggest single group of skills observed in the municipality, which is in line with the formal employment and economic profile of the area requiring labourers in the agriculture, mining and other industries. Services workers and shop sales workers, as well as craft and related trade workers represent the second and the third largest group of formal occupation in the area. This again fits the profile of the local economy, where the former are largely engaged in the trade and personal services sector, while the latter is involved in the agricultural and mining industries.

5.15.6 Income

The average monthly household income in the Siyathemba LM was R6 858 in 2014 prices. This was less than the national, provincial and district levels, which had average household incomes of R9 743, R8 116 and R7 030, respectively. Overall, approximately two thirds of the population in the Siyathemba LM earns up to R3 200 a month, this is larger than the same group at district and provincial level. According to the Pixley ka Seme IDP, the cut-off monthly household income for indigence in the Siyathemba LM is R1 500. This refers to those households who, due to a number of socio-economic factors, are unable to afford basic services such as water, basic sanitation, basic energy, health care, housing, food and clothing. From income data obtained in the 2011 Census, approximately 39.4% of the households would qualify as indigent in the local municipality.

Table 26: Household per monthly income groups (2011)

Indicator	Siyathemba LM	Towns/main places in the Siyathemba LM					
		Copperton	Marydale	Niekerkshoop	Prieska	Siyathemba NU	Westerberg
No income	7.1%	25%	9.1%	10.6%	8%	3.8%	0%
R1 – R3 200	62.9%	25%	49.5%	76.1%	55.56%	77%	100%
R3 201 – R6 400	10.9%	0%	18.5%	3.8%	14.6%	4.3%	0%
R6 401– R12 800	9.1%	25%	12.1%	3.3%	12.3%	3.7%	0%
R12 801– R25 600	5.9%	25%	4.7%	3.8%	6.4%	5.8%	0%
R25 601– R51 200	1.3%	0%	0%	0%	1.7%	1.5%	0%
>R51 200	0.3%	0%	0%	0.8%	0.2%	0.5%	0%

(Stats SA, 2015)

Table 26 shows the income spread for the various settlements/towns in the Siyathemba LM. Niekerkshoop is by far the poorest community of the delineated areas, with nearly 87% of its population earning less than R3 200 a month. This is followed by Prieska with 64% and Marydale 58.6% for the same income spread. Copperton shows that 50% of its population lives below the R3 200 income level, which is far less than other delineated areas. This can be attributed to the small population size that exists in Copperton.

In terms of education levels in the LM, 11.5% of the adult population (over 20 years of age) had no education at all, while 64% have primary or secondary education (Stats SA, 2015).Those with higher

educational qualifications accounted for 5.5% of the population. These figures indicate an increase in all categories since 2001, except for the no schooling, some primary and some secondary categories. In general, there has been an improvement in the educational qualifications of the labour force in the local municipality. The no schooling category decreased by 10%, indicating a higher percentage of people attending school. While the share of people with no schooling at district level is 14.1%, the percentage of people with no schooling is notably lower at provincial (11.1%) and LM (11.5%) level. Additionally, the number of people who have completed matric in Siyathemba is 17.3%, which is lower than the 20% and 22.1% at district and provincial levels, respectively.

The relatively low level of education in the LM is supported by the economic profile that exists in the region. The dependence of household income on the Agricultural, and Wholesale and retail trade sectors would act as a disincentive for further higher education studies, as sectors that support such employment are not well developed in the area.

5.15.7 Access to Services and State of Local Built Environment

Access to shelter, water, electricity, sanitation, and other services are indicators that assist to determine the standard of living of the people in the area under investigation. Infrastructure and the state of local infrastructure is another indicator to contemplate when considering living standards. The availability of social and economic infrastructure including roads, educational facilities, and health facilities further indicates the nature of the study area, which is valuable in developing a complete profile of the circumstances in which communities are living. These measurements create a baseline against, which the potential impacts of the proposed project can be assessed.

5.15.7.1 *Settlement profile*

The Siyathemba LM is characterised by a low population density when compared to the national level (about 42 people/km^2). However, the municipal population density is half that of the Province but nearly the same as the district.

Table 27: Population density of Siyathemba LM (2011)

Indicator	**Siyathemba LM**	**Towns/main places in the Siyathemba LM**					
		Copperton	Marydale	Niekerkshoop	Prieska	Siyathemba NU	Westerberg
Population total	21 593	55	2 622	1 829	14 248	2 765	74
Area (Sqr Km)	14 725	71	63	31	196	14 355	9
Population density	1.5	0.8	41.4	59	72.9	0.2	8

(Stats SA, 2015)

Population densities for the entire LM are extremely low, showing 1.5 individuals for every square kilometre. When focusing on the towns, it can be seen that Copperton is one of the most sparsely

populated towns in the entire LM, showing 0.8 individuals for each square kilometre. Prieska is by far the most densely populated town in the LM, showing nearly 73 individuals for every square kilometre. This fact, coupled with its high population, indicates that it is the commercial hub for the LM. The large agriculture sector that exists in the LM supports the low population densities in the settlements, as large portions of land are used for sheep farming.

5.15.7.2 Access to Housing and Basic Services

- *Housing*

Approximately 85% of the households in the Siyathemba LM reside in formal housing in the form of a house or other brick structures on a separate stand or yard. 14.3% of the households live in informal dwellings. Furthermore, 0.7% of the municipality's households live in traditional dwellings. These numbers are similar to those of Prieska, with about 85.3% households living in formal dwellings, while 14.5% live in informal structures.

The allocation of funds for Siyathemba Municipality is relatively small. The Municipality is therefore, struggling to address the housing need in the area. With the Housing Allocation to date, the LM managed to build 223 new RDP housing units in Prieska. New applications have been submitted to COGHSTA for 310 RDP units in Prieska, 55 in Marydale, and 54 in Niekerkshoop (Siyathemba LM, 2014).

- *Access to water*

In terms of access to piped water, 88.7% of the households in the municipality have access to piped water either inside the dwelling or in the yard. The picture improves in Prieska, where 94.9% of the households have access to piped water inside their dwellings or yard. Only 1.2% of the households in the town do not have access to piped water at all. In terms of the supply, the bulk of the water in the LM is supplied by the municipality or other service providers. In Prieska, close to 97% of the households' water is supplied by the municipality or other water service providers, while in the non-urban areas of the municipality only 1.1% of water is supplied by bulk water infrastructure connections. Two thirds of the households in non-urban areas used boreholes (Stats SA, 2014). The district's IDP notes that water provision and availability is one of the issues that will have to be addressed in order to improve the economic activity in most towns situated within the Pixley ka Seme District Municipal area (Pixley ka Seme District Municipality, 2014/15).

Bulk water supply for Prieska is sustainable while bulk water supply for Marydale and Niekerkshoop is expected to become a problem within the next 15- 18 years. Therefore, new bulk water supply studies have been commissioned for Niekerkshoop, which is expected to experience water shortages first (Siyathemba LM, 2014).

- *Access to sanitation*

If not properly managed and monitored, sewerage and sanitation are basic needs of communities that can pose serious health and hygiene risks. 71.2% of the households in the Siyathemba LM had access to a flushing toilet, while 16.8% of the households used pit latrines. 7.7% of families have no access to toilet facilities and 3.8% is still using the bucket system. According to the Siyathemba LM IDP, the municipality has a sanitation backlog of 470 households.

During the 2011/12 financial year, the Municipality received funds from DWA through the Accelerated Community Infrastructure Programme (ACIP). This grant was utilised to refurbish sanitation infrastructure and equipment. The following projects were set in motion but no information was available on which had been completed:

- Prieska:
    - Purchase of two standby sewer pumps
    - Refurbishment of sewer tank intake
    - Replacement of manhole covers at main sewer pump sets
- Marydale:
    - Refurbishment of sewer tank intake
    - Refurbishment/ replacement of night soil suction tanker
    - Fence oxidation pond area
- Niekerkshoop:
    - Refurbishment of sewer tank intake into oxidation ponds
    - Refurbishment/ replacement of sewer tanker

- *Access to electricity*

The indicator “energy for lighting” was used as a proxy for measuring households’ access to electricity. The majority of households (86.3%) in the municipality have access to electricity, while 13.7% use alternative forms of energy for lighting; mainly candles (11%).

The Municipality has developed an Electricity Master Plan in the early 2000s. The Municipality works according to this plan to upgrade electricity infrastructure, as well as to develop new infrastructure (Siyathemba LM, 2014).

- *Transport infrastructure*

Spatially, Siyathemba is very distant from South Africa’s largest consumer markets. It is located some 182km from De Aar (administrative seat of the Pixley ka Seme DM) and 236km from Kimberley. The area is traversed by the R357, which links the site to Prieska. Prieska has easy access to the main railway line to Namibia, and good tarred road connections to Upington, Kimberly and De Aar.

Copperton can be accessed through the R357 from Prieska, which is a tarred road, as well as various unnamed dirt roads that stem from a North Westerly direction near Eureka itself. These dirt roads lead to Marydale but are not adequate for large traffic volumes and many vehicle drivers choose the tarred roads from Marydale to Prieska and then to Copperton. There are also tarred roads that lead to the Alkantpan military testing facility. From the aforementioned it can be seen that access to the proposed location is limited to very few quality tarred road and may need to be improved when considering any further developments in said area.

The rural nature of the area impacts on the modes of transport relied on by local population for travelling from and to work. The Northern Cape Province has the largest percentage of people compared to other Provinces who “walk” to and from work (Department of Transport, 2013). Those who rely on some mode of transportation for travelling to and from work mainly make use of private transport. Public transport is the mode of choice among a relatively small percentage of people living in the Province. All of the above suggests that the local area is likely to have limited access to public transport due to relatively low population densities.

- *Social and Recreational Infrastructure*

The Siyathemba LM has the following social and recreational infrastructure available:

- Where education facilities are concerned, the municipality has one crèche, 6 primary schools and 3 combined schools and one secondary school.
- The municipality has five community halls.
- There are four libraries in the municipality.
- Recreational facilities are available in each of the three towns
- There is a police station in each of the three towns (Marydale, Prieska and Nierkerkshoop)

- There are five health facilities in the municipality, i.e. one hospital, three clinics and a mobile clinic. It is indicated that the main challenge is the lack of ambulance services in Nierkerkshoop (Siyathemba Local Municipality, 2014).

5.15.8 Site-Related Information

The site related information section will investigate the various dynamics of the proposed site to ensure that the current land use activity does not conflict with the establishment of the proposed facility. If there are any conflicts identified, then they will be investigated further in the next phase.

- *Land-use profile*

The proposed site will directly affect four farm portions of land namely: portion 1, 2, 3 and the remainder of Drielingspan No. 101. The proposed site lies on the urban edge of Copperton, approximately 7km away from the city centre and is easily accessed by the R357 main road.

Land uses for the aforementioned portion include could not be obtained at this time but will be investigated during the next phase of study.

The various farm portions and their land uses are described in the table below.

Table 28: Land uses in the zone of influence

Farm	Type of effect	Information
Portion1,2,3 and the remainder of Drielingspan no. 101	Directly affected (Wind facility site)	• No information could be obtained due to owners' circumstances • Commercial sheep farming
Portion 1 of Bosjesmansberg no. 67	Adjacent	• No contact information
Remainder of Uitzigt no. 69	Adjacent	• No information could be obtained due to owners' circumstances
Portion 2 of Uitzigt no. 69	Adjacent	• No contact could be made
Portion 3 of Klein Modderfontein no. 100	Adjacent	• No correct contact information available
Portion 2 of Jonkerwater 121	Adjacent	• No contact could be made
Remainder of Platsjambok no. 102	Adjacent	• Commercial sheep farm (7000 ha) • 2 residents living on farm • No labourers • Land owner opinion: Is concerned about the effect that the turbines will have on radio and cell phone signals after the SKA project revealed concerns that it may affect their project.

Remainder of Humansrus no. 147	Adjacent	• No answer at provided contact details

The region is also known for various other renewable energy projects such as:

- The solar PV farm in the south east of Copperton
- A wind farm on the original Nelspoortjie farmstead within the same region as the proposed site.

- *Resources and land capability*

Generally, the area does not have any significant mineral deposits. To the south of Prieska, on the farm Doornfontein, a medium-sized mineral deposit of Phosphate can be found. Various small mineral deposits can be found near Niekerkshoop. These include Tiger's-eye and Crocidolite (i.e. asbestos). Small deposits of Alluvial Diamonds can be found in the Orange River. Other small mineral deposits within the municipal boundary include Salt, Gypsum, Iron and Uranium (Siyathemba LM, 2014).

The arid nature of the associated farm portions creates difficulties for traditional irrigation farming; as a result, commercial farming in the area is limited to sheep/goat farming. These farming types require minimal inputs with respect to water and grazing capacities. Even so, the drought experienced over the last couple of years has resulted in reduced livestock capacities leading to many farmers downscaling their farming activities.

- *Access to infrastructure*

Bulk infrastructure on the affected farm portions is limited. The R357 is in close proximity to the new site, but other roads will have to be created for transport into the farthest reaches of the proposed site. Electricity supply is sufficient mainly due to existing substation located in Copperton, while access to water remains limited and many farmers have resorted to bore holes for their water supply. Copperton itself does have a water supply network but it is too far away and too expensive to be considered for everyday use by the affected farm portions. There is no existing infrastructure on the proposed site for stormwater pipes, which can be attributed to the arid nature of the region and the fact that it is farmlands, which do not require diversion of heavy rainfall associated water.

The LM has not made provision for improving infrastructure in the area due to low population densities and subsequently lower service delivery priority assigned for the area. This might indicate that the responsible company may have to fund the provision of necessary infrastructure.

5.16 Traffic

The Traffic Assessment was conducted by Dirk van der Merwe of BVi Consulting Engineers BVi . The full report is included in Appendix 6J.

The turbine components will be transported to the site over a distance of between 900km to 1200km, from Saldanha harbour. A number of routes were identified for the transport of the turbines and are described below.

The delivery of materials such as cement, aggregate and sand will in all probability be from Upington along the National Route N10. Steel will be delivered from either Gauteng via the N12 or Cape Town via the N1 and N12. It is assumed that labour will commute from Prieska as it is the nearest town to provide amenities.

5.16.1 Route Alternative 1 – Saldanha to Aletta WEF via Loeriesfontein (1220km)

This route may be the preferred option as it avoids the Van Rhyns Pass and the Piekenierskloof Pass. Some route clearing may be needed with certain portions of the route already cleared for other wind energy projects. It must be noted that there are portions of this route that are gravel roadways. The route overview is shown in **Figure 39** below.

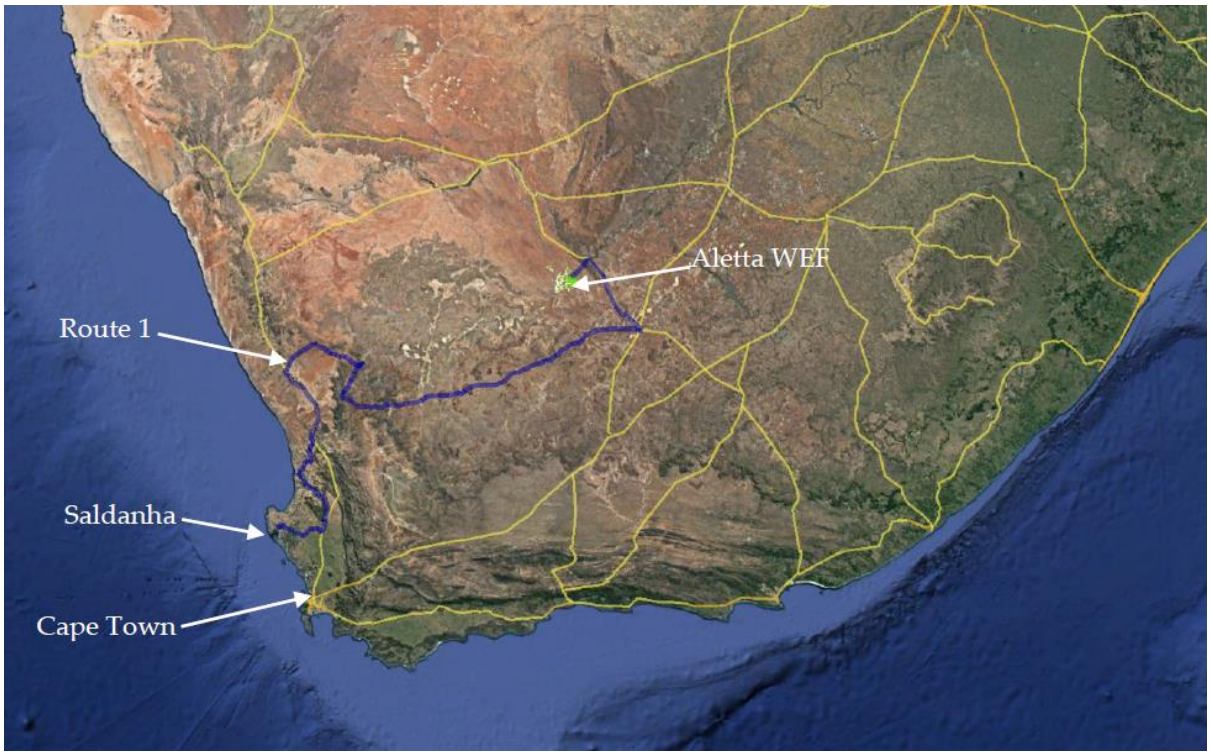


Figure 39: Transportation Route 1

5.16.2 Route Alternative 2 – Saldanha to Aletta WEF via Vanrhynsdorp (1018km)

The Vanrhyns Pass is not easily traversable by abnormal load vehicles and is therefore not a feasible nor recommended route. The route overview is shown in **Figure 40** below.

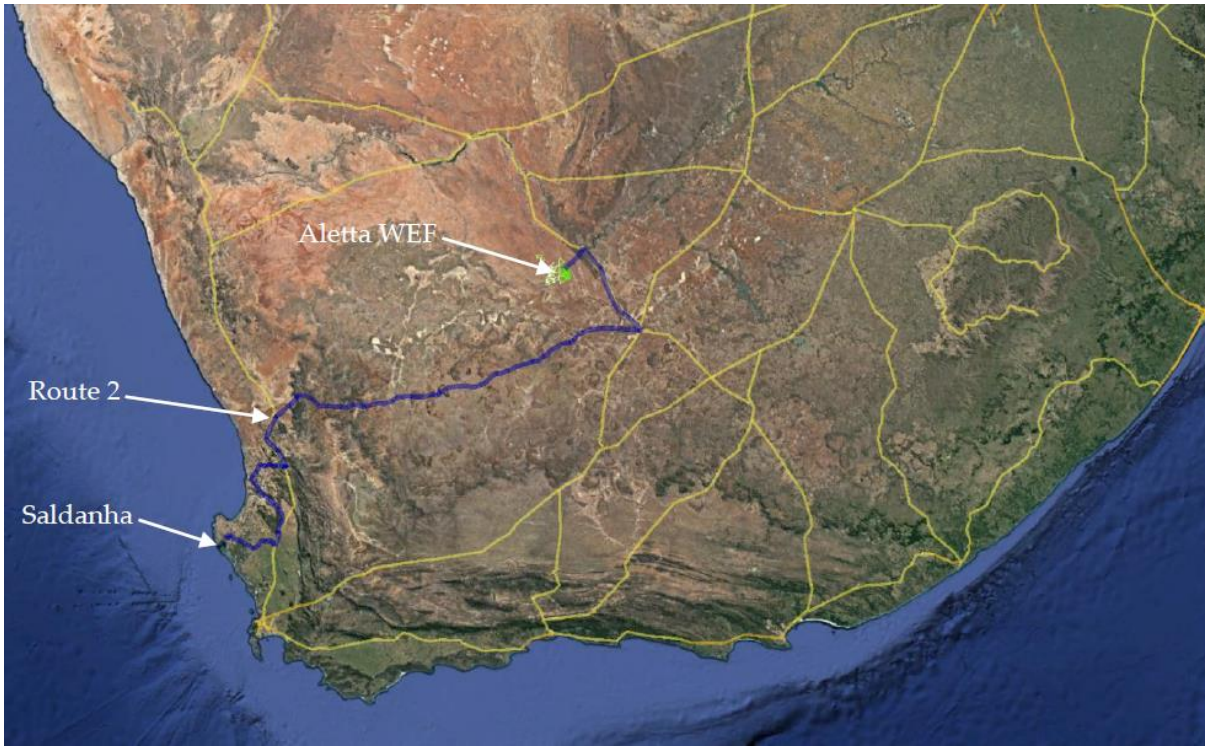


Figure 40: Transportation Route 2

5.16.3 Route Alternative 3 – Saldanha to Aletta WEF via National Route N1 (950km)

There are a number of non-traversable obstacles on this route such as interchange bridges and pedestrian bridges which will make this route not feasible. The route overview is shown in **Figure 41** below.

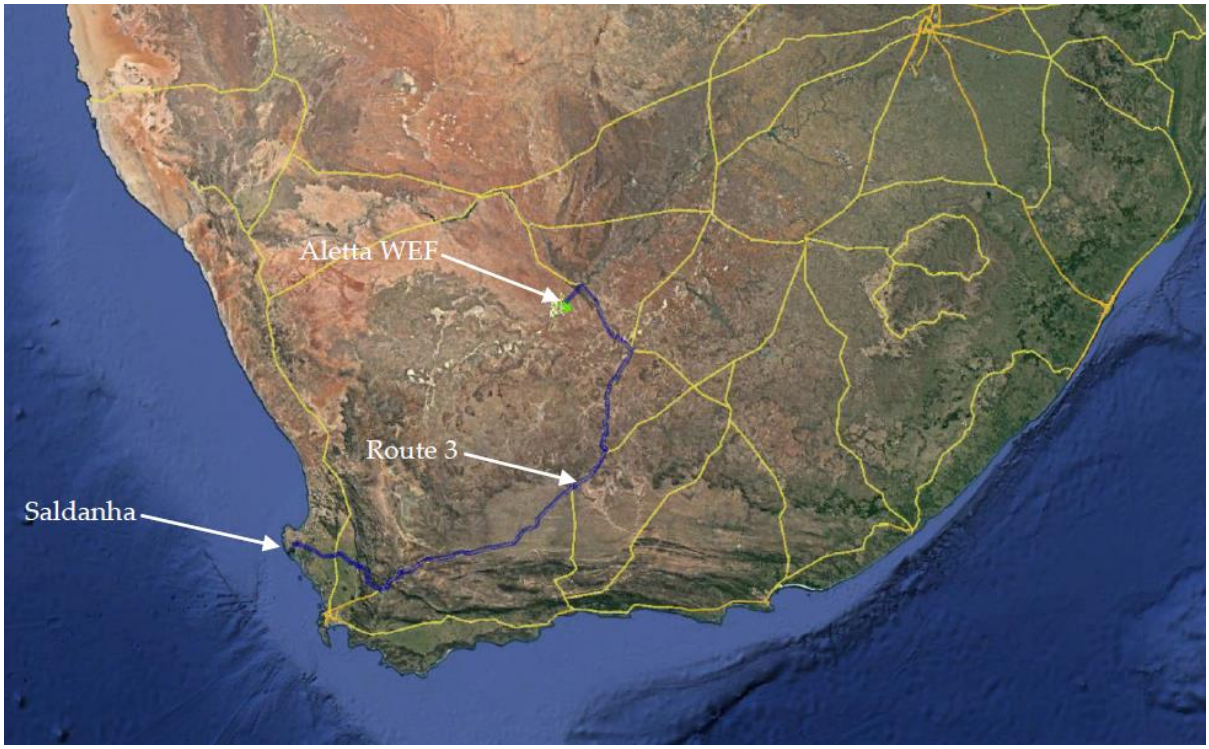


Figure 41: Transportation Route 3

5.16.4 Route Clearance

The vehicles used to transport the wind turbine equipment are abnormal load or oversize vehicles. Combinations or minor alternative sections may be needed. The transport route must however be cleared and all relevant permits obtained prior to the transport activities taking place.

5.16.5 Permits & Consent Relating to Roads

The permits and consent required from authorities necessary for the transport of oversize loads are summarised in the table below. This summary is not necessarily exhaustive and further investigation will be needed by the route clearing consultant.

Table 29: Permits and consent requirements

Permit	Authorising Authority	Responsible Party
Abnormal Load/Vehicle Permit in terms of National Road Traffic Act 93 of 1996, Section 81	Western Cape Provincial Department of Roads and Transport	The Contractor will obtain the necessary road transportation permits.
The South African National Roads Agency Limited and National Roads Act, Act 7 of 1998	SANRAL Western Region	The Contractor will obtain clearance from the South African National Roads Agency.

Abnormal Load/Vehicle Permit in terms of National Road Traffic Act 93 of 1996, Section 81	Northern Cape Provincial Department of Roads and Transport	The Contractor will obtain the necessary road transportation permits.

5.16.6 Trip Generation

The roadways affected by the component delivery are operating well within the level of service parameters. The average heavy vehicle volume along the route is 21%.

The development will generate 6845 trips over an 18 month period. The trips generated by the construction activities are mainly due to the transport of components and materials.

It was assumed that two (2) turbines will be delivered to site each week which roughly equates three (3) deliveries per day. Fifteen normal heavy and light vehicles will also travel to and from site daily but, over a much shorter distance. The latter was therefore only added to the traffic on the N10.

5.16.7 Impact on Long Distance Route

The *HCM 2010 Chapter 15: Two lane Highways* was consulted as the greatest portion of the route to be travelled by the delivery trucks are rural two lane highways of Class I, II or III. The trips generated by this development were evaluated in relation to the quantum of trips needed to change the Level of Service (LOS) on a portion of the rural highway and the ultimate capacity of two lane highways. The projected truck trips per day are deemed to be of no consequence to the LOS of the travelled route from Saldanha to Prieska.

With regard to the speed at which these vehicles travel it can be advised to allow queuing vehicles to pass at regular intervals as needed. This should however not be problematic when considering the low volumes of traffic on the roadways being used.

5.16.8 Impact on Local Traffic

The ultimate accepted capacity of a two lane highway is 3200 vehicles per hour. From historic traffic count data it was observed that the N10 roadway at Prieska have an abundance of spare capacity, as the current ADT along this roadway is around 300vpd. This therefore indicates that the estimated additional traffic generated by the construction staff travelling to and from site, can be accommodated on the existing roadways.

Adequate traffic accommodation signage must be erected and maintained on either side of the access on road R357 throughout the construction period as well as on the National Road N10.

5.16.9 Site Access Route

Access to the site will be via an existing gravel track off the R357, which is currently the farmer's access road, approximately 34km from the N10 intersection. This gravel road will need upgrading and extension and will need to be suitably maintained. Re-gravelling may be necessary as a maintenance measure, from time to time, throughout the operational life of the plant. Sight distance at the access is more than adequate and the pavement structure seems to be sound and with little to no defects.

5.16.10 Effected Communities

It is expected that the community of Prieska will participate in the construction phase of this development. From a traffic point of view, the total daily construction traffic is deemed to be very low and will not significantly impact this community.

6 ENVIRONMENTAL ISSUES, POTENTIAL IMPACTS AND CUMULATIVE IMPACTS

6.1 Methodology for Assessing Impacts

The Impact Assessment Methodology assists in evaluating the overall effect of a proposed activity on the environment. The determination of the effect of an environmental impact on an environmental parameter is determined through a systematic analysis of the various components of the impact. This is undertaken using information that is available to the environmental practitioner through the process of the environmental impact assessment. The impact evaluation of predicted impacts was undertaken through an assessment of the significance of the impacts.

6.1.1 Determination of Significance of Impacts

Significance is determined through a synthesis of impact characteristics which include context and intensity of an impact. Context refers to the geographical scale i.e. site, local, national or global whereas Intensity is defined by the severity of the impact e.g. the magnitude of deviation from background conditions, the size of the area affected, the duration of the impact and the overall probability of occurrence. Significance is calculated as shown in Table 94.

Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The total number of points scored for each impact indicates the level of significance of the impact.

6.1.2 Impact Rating System

Impact assessment must take account of the nature, scale and duration of effects on the environment whether such effects are positive (beneficial) or negative (detrimental).

- Rating System Used To Classify Impacts

The rating system is applied to the potential impact on the receiving environment and includes an objective evaluation of the mitigation of the impact. Impacts have been consolidated into one rating. In assessing the significance of each issue the following criteria (including an allocated point system) is used:

Table 30: Description of terms

NATURE		
Include a brief description of the impact of environmental parameter being assessed in the context of the project. This criterion includes a brief written statement of the environmental aspect being impacted upon by a particular action or activity.		
GEOGRAPHICAL EXTENT		
This is defined as the area over which the impact will be expressed. Typically, the severity and significance of an impact have different scales and as such bracketing ranges are often required. This is often useful during the detailed assessment of a project in terms of further defining the determined.		
1	Site	The impact will only affect the site
2	Local/district	Will affect the local area or district
3	Province/region	Will affect the entire province or region
4	International and National	Will affect the entire country
PROBABILITY		
This describes the chance of occurrence of an impact		
1	Unlikely	The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).
2	Possible	The impact may occur (Between a 25% to 50% chance of occurrence).
3	Probable	The impact will likely occur (Between a 50% to 75% chance of occurrence).
4	Definite	Impact will certainly occur (Greater than a 75% chance of occurrence).
REVERSIBILITY		
This describes the degree to which an impact on an environmental parameter can be successfully reversed upon completion of the proposed activity.		

1	Completely reversible	The impact is reversible with implementation of minor mitigation measures
2	Partly reversible	The impact is partly reversible but more intense mitigation measures are required.
3	Barely reversible	The impact is unlikely to be reversed even with intense mitigation measures.
4	Irreversible	The impact is irreversible and no mitigation measures exist.
IRREPLACEABLE LOSS OF RESOURCES		
This describes the degree to which resources will be irreplaceably lost as a result of a proposed activity.		
1	No loss of resource.	The impact will not result in the loss of any resources.
2	Marginal loss of resource	The impact will result in marginal loss of resources.
3	Significant loss of resources	The impact will result in significant loss of resources.
4	Complete loss of resources	The impact is result in a complete loss of all resources.
DURATION		
This describes the duration of the impacts on the environmental parameter. Duration indicates the lifetime of the impact as a result of the proposed activity		
1	Short term	The impact and its effects will either disappear with mitigation or will be mitigated through natural process in a span shorter than the construction phase (0 – 1 years), or the impact and its effects will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).
2	Medium term	The impact and its effects will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).
3	Long term	The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 50 years).
4	Permanent	The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered transient (Indefinite).
CUMULATIVE EFFECT		
This describes the cumulative effect of the impacts on the environmental parameter. A cumulative effect/impact is an effect which in itself may not be significant but may become significant if added to		

other existing or potential impacts emanating from other similar or diverse activities as a result of the project activity in question.		
1	Negligible Cumulative Impact	The impact would result in negligible to no cumulative effects
2	Low Cumulative Impact	The impact would result in insignificant cumulative effects
3	Medium Cumulative impact	The impact would result in minor cumulative effects
4	High Cumulative Impact	The impact would result in significant cumulative effects
INTENSITY / MAGNITUDE		
Describes the severity of an impact		
1	Low	Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.
2	Medium	Impact alters the quality, use and integrity of the system/component but system/ component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).
3	High	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.
4	Very high	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired (system collapse). Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.
Significance		
SIGNIFICANCE		
Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. This describes the significance of the impact on the environmental parameter. The calculation of the significance of an impact uses the following formula: **(Extent + probability + reversibility + irreplaceability + duration + cumulative effect) x magnitude/intensity.** The summation of the different criteria will produce a non weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating.		
Points	**Impact Significance Rating**	**Description**

6 to 28	Negative Low impact	The anticipated impact will have negligible negative effects and will require little to no mitigation.
6 to 28	Positive Low impact	The anticipated impact will have minor positive effects.
29 to 50	Negative Medium impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures.
29 to 50	Positive Medium impact	The anticipated impact will have moderate positive effects.
51 to 73	Negative High impact	The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact.
51 to 73	Positive High impact	The anticipated impact will have significant positive effects.
74 to 96	Negative Very high impact	The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws".
74 to 96	Positive Very high impact	The anticipated impact will have highly significant positive effects.

6.2 Identification of Potential Impacts

The proposed development is likely to result in a variety of positive and negative impacts. Moreover, the proposed development could potentially result in collective and long term impacts more commonly known as cumulative impacts. A cumulative impact is the impact of an activity that, in itself, may not be significant but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area.

The Scoping report assists in the identification of these potential and cumulative impacts, which will then be assessed at a more detailed level during the EIA stage.

Moreover, further details associated with the construction and operation of the various activities (as listed in the Project Description) in light of the above types of impacts that become available later in the EIA process will be discussed in detail in the EIA Phase.

The impacts that have been identified as being potentially significant are elaborated on in the sub-sections below.

6.2.1 Biodiversity Impacts

The following potential impacts have been identified for the proposed wind energy facility development and will be further investigated in the EIA phase of the biodiversity assessment.

Table 31: Impacts on indigenous natural vegetation

Loss of indigenous natural vegetation		
Environmental parameter	Indigenous natural vegetation	
Issue/Impact/Environmental Effect/Nature	Loss, degradation or fragmentation of vegetation.	
Extent	The impact will affect natural vegetation on site and possibly in immediately surrounding areas.	
Probability	The impact will definitely happen.	
Reversibility	Irreversible in human timeframes, since natural successional processes cannot compensate for complete local loss of habitat and diversity. Secondary vegetation will probably never resemble the original vegetation found on site.	
Irreplaceable loss of resources	Significant loss of resources will occur.	
Duration	The impact will be permanent (mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered transient.)	
Cumulative effect	Low cumulative impact. Added to existing impacts on natural habitat from mining activities in the general region, the current project will cause additional loss of vegetation, but the cumulative effect will not be great.	
Intensity/magnitude	Medium. Regional vegetation will continue to function.	
Significance rating	Medium negative impact expected.	
	Pre-mitigation impact rating	Post-mitigation impact rating
Extent	1	1
Probability	4	4
Reversibility	4	4
Irreplaceable loss	3	3
Duration	4	4
Cumulative effect	2	2
Intensity/magnitude	2	2
Significance rating	-36 (medium negative)	-36 (medium negative)
Mitigation measures	The following mitigation measures would help to limit impacts: 1. Restrict impact to development footprint only and limit disturbance creep into surrounding areas. 2. As far as possible, locate infrastructure within areas that have been previously disturbed or in areas with lower sensitivity scores. 3. Undertake detailed field surveys of the proposed footprint of infrastructure to locate any sensitive ecological features. If necessary, shift infrastructure to avoid impacts on specific features. 4. Compile a Rehabilitation Plan.	

	5. Compile an Alien Plant Management Plan, including monitoring, to ensure minimal impacts on surrounding areas.

Table 32: Impacts on near threatened plant species

Loss of individuals of near threatened plants		
Environmental parameter	One near threatened plant species that could potentially occur on site	
Issue/Impact/Environmental Effect/Nature	Loss of individuals.	
Extent	The impact will affect local populations or individuals of the affected species.	
Probability	The impact may possibly happen.	
Reversibility	Partly reversible. Individuals can be rescued, but this is not considered an effective conservation measure.	
Irreplaceable loss of resources	Marginal loss of resources could occur. The species that is likely to occur on site is scattered across a relatively wide geographical range.	
Duration	The impact will be effectively permanent within the areas where it would be lost.	
Cumulative effect	Low cumulative impact. Cumulative effects will not be significant.	
Intensity/magnitude	Medium. Loss of some individuals will be relatively insignificant compared to the number that probably occur in surrounding areas, but this depends on whether the species occurs on site and how many individuals will be affected.	
Significance rating	Low negative impact expected.	
	Pre-mitigation impact rating	Post-mitigation impact rating
Extent	1	1
Probability	2	2
Reversibility	2	2
Irreplaceable loss	2	1
Duration	4	4
Cumulative effect	2	1
Intensity/magnitude	2	1
Significance rating	-26 (low negative)	-9 (low negative)
Mitigation measures	It is a legal requirement to obtain permits for specimens that will be lost. A pre-construction walk-through survey will be required during a favourable season to locate any affected plants. Plants lost to the development can be rescued and planted in appropriate places during rehabilitation. This will reduce the irreplaceable loss of resources as well as the cumulative effect and overall intensity. Where	

	concentrations of the plant are found, infrastructure components should be shifted to avoid such areas.

Table 33: Impacts on protected plant species, as per NEM:BA and Northern Cape Nature Conservation Act.

Loss of individuals of protected plants		
Environmental parameter	Protected plants, as per NEM:BA and Northern Cape Nature Conservation Act.	
Issue/Impact/Environmental Effect/Nature	Loss of individuals.	
Extent	The impact will affect local populations or individuals of the affected species.	
Probability	Based on the list of species that are protected, the impact will almost certainly happen.	
Reversibility	Partly reversible. Individuals can be rescued or else cultivated to replace lost specimens.	
Irreplaceable loss of resources	Marginal loss of resources could occur. The species that are likely to occur on site are likely to be relatively common throughout their range.	
Duration	The impact will be medium-term.	
Cumulative effect	Low cumulative impact. Cumulative effects will not be significant.	
Intensity/magnitude	Low. Loss of some individuals will be insignificant compared to the number that probably occur in surrounding areas.	
Significance rating	Low negative impact expected.	
	Pre-mitigation impact rating	Post-mitigation impact rating
Extent	1	1
Probability	2	2
Reversibility	2	2
Irreplaceable loss	2	1
Duration	2	2
Cumulative effect	2	1
Intensity/magnitude	1	1
Significance rating	-11 (low negative)	-9 (low negative)
Mitigation measures	It is a legal requirement to obtain permits for specimens that will be lost. A pre-construction walk-through survey will be required during a favourable season to locate any protected plants. Plants lost to the development can be rescued and planted in appropriate places in rehabilitation areas. This will reduce the irreplaceable loss of resources as well as the cumulative effect.	

Table 34: Loss of individuals of protected trees

Loss of individuals of protected trees		
Environmental parameter	Protected trees, as per National Forests Act.	
Issue/Impact/Environmental Effect/Nature	Loss of individuals.	
Extent	The impact will affect local populations or individuals of the affected species.	
Probability	The impact may possibly happen.	
Reversibility	Partly reversible. Individuals can be rescued or else cultivated to replace lost specimens, but this is likely to have limited value as a mitigation measure.	
Irreplaceable loss of resources	Marginal loss of resources could occur. The species that are likely to occur on site are likely to be relatively common throughout their range.	
Duration	The impact will be medium-term.	
Cumulative effect	Low cumulative impact. Cumulative effects will not be significant.	
Intensity/magnitude	Low. Loss of some individuals will be insignificant compared to the number that probably occur in surrounding areas.	
Significance rating	Low negative impact expected.	
	Pre-mitigation impact rating	Post-mitigation impact rating
Extent	1	1
Probability	2	2
Reversibility	2	2
Irreplaceable loss	2	1
Duration	2	2
Cumulative effect	2	1
Intensity/magnitude	1	1
Significance rating	-11 (low negative)	-9 (low negative)
Mitigation measures	It is a legal requirement to obtain permits for specimens that will be lost. A pre-construction walk-through survey will be required to locate any protected trees. Concentrations of plants can be avoided by shifting infrastructure components, where necessary. This will reduce the irreplaceable loss of resources as well as the cumulative effect.	

Table 35: Impacts on watercourses / drainage areas

Damage to watercourses / drainage areas and pan depressions	
Environmental parameter	Watercourses, drainage areas and pan depressions
Issue/Impact/Environmental Effect/Nature	Loss, degradation or fragmentation of vegetation.
Extent	The impact may affect watercourses / drainage areas and pan depressions on site.

Probability	The impact will probably happen	
Reversibility	Irreversible in human timeframes, since natural successional processes cannot compensate for complete local loss of habitat and diversity. Secondary vegetation will probably never resemble the original vegetation found on site.	
Irreplaceable loss of resources	Marginal loss of resources will occur.	
Duration	The impact will be permanent (mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered transient.)	
Cumulative effect	Medium cumulative impact. Added to existing impacts on natural habitat, the current project will cause additional loss of habitat.	
Intensity/magnitude	Medium. Wetland systems will probably continue to function, but in a modified way.	
Significance rating	Medium negative impact expected.	
	Pre-mitigation impact rating	Post-mitigation impact rating
Extent	1	1
Probability	4	2
Reversibility	4	2
Irreplaceable loss	2	2
Duration	4	2
Cumulative effect	2	1
Intensity/magnitude	2	1
Significance rating	-30 (medium negative)	-10 (low negative)
Mitigation measures	The following mitigation measures would help to limit impacts: 1. Select alternative sites for infrastructure where features of concern may be affected. 2. Prevent erosion impacts on wetland systems. 3. Rehabilitate disturbance as quickly as possible. 4. Prevent invasion by alien plants. 5. Undertake monitoring to evaluate whether further measures would be required to manage impacts.	

Table 36: Impacts on sedentary fauna

Mortality of individuals of sedentary fauna	
Environmental parameter	Littledale's Whistling Rat and the Giant Bullfrog
Issue/Impact/Environmental Effect/Nature	Loss of individuals.
Extent	The impact will affect individuals on site and possibly in immediately surrounding areas.
Probability	The impact may possibly happen.

Reversibility	Partly reversible. Preventative measures could reduce mortality to below replacement levels.	
Irreplaceable loss of resources	Marginal loss of resources will occur.	
Duration	The impact will be long-term.	
Cumulative effect	Medium cumulative impact. Cumulative effects will be minor.	
Intensity/magnitude	Medium. May impact on population processes.	
Significance rating	Low negative impact expected.	
	Pre-mitigation impact rating	Post-mitigation impact rating
Extent	1	1
Probability	2	1
Reversibility	2	2
Irreplaceable loss	2	2
Duration	3	3
Cumulative effect	3	2
Intensity/magnitude	2	1
Significance rating	-26 (low negative)	-11 (low negative)
Mitigation measures	Undertake field surveys to determine whether either species does or could occur on site or not. If either species occurs on site, the habitat requirements of the species on site needs to be determined. Infrastructure must then avoid sensitive areas or else measures must be put in place to minimise impacts.	

Table 37: Impact of displacement of mobile fauna

Displacement of individuals of mobile fauna		
Environmental parameter	Mobile fauna of conservation concern	
Issue/Impact/Environmental Effect/Nature	Displacement of individuals.	
Extent	The impact will affect individuals on site and possibly in immediately surrounding areas.	
Probability	The impact may possibly happen.	
Reversibility	Partly reversible with time.	
Irreplaceable loss of resources	No or low loss of resources will occur.	
Duration	The impact will be short-term (construction phase).	
Cumulative effect	Low cumulative impact. Cumulative effects will be minor.	
Intensity/magnitude	Low. May impact on population processes.	
Significance rating	Low negative impact expected.	
	Pre-mitigation impact rating	Post-mitigation impact rating
Extent	1	1
Probability	2	1
Reversibility	2	2

Irreplaceable loss	1	1
Duration	1	1
Cumulative effect	1	1
Intensity/magnitude	1	1
Significance rating	-8 (low negative)	-7 (low negative)
Mitigation measures	Undertake field surveys to determine whether species does or could occur on site or not. If species occurs on site, the habitat requirements of the species on site needs to be determined. Infrastructure must then avoid sensitive areas or else measures must be put in place to minimise impacts.	

Table 38: Impact summary table for the establishment and spread of declared weeds

Establishment and spread of declared weeds		
Environmental parameter	Vegetation and habitat	
Issue/Impact/Environmental Effect/Nature	Loss of habitat due to invasion by alien plants	
Extent	The impact will affect habitat on site and possibly in immediately surrounding areas.	
Probability	The impact will probably happen in the absence of control measures.	
Reversibility	Partly reversible in the absence of control measures. Completely reversible if mitigation measures applied. Preventative measures will stop the impact from occurring.	
Irreplaceable loss of resources	Marginal to significant loss of resources will occur. Uncontrolled invasion can affect all nearby natural habitats.	
Duration	The impact will be long-term.	
Cumulative effect	Low cumulative impact. Cumulative effects will not be significant.	
Intensity/magnitude	Medium. Severe invasion can alter the functioning of natural ecosystems.	
Significance rating	Low negative impact expected.	
	Pre-mitigation impact rating	Post-mitigation impact rating
Extent	1	1
Probability	3	2
Reversibility	2	1
Irreplaceable loss	3	2
Duration	3	3
Cumulative effect	2	2
Intensity/magnitude	2	1
Significance rating	-28 (medium negative)	-11 (low negative)

Mitigation measures	Undertake surveys to determine which species occur on site and whether there are any major concentrations of alien species. Compile and implement an alien management plan. Undertake regular monitoring to detect alien invasions early so that they can be controlled. Implement control measures.

6.2.2 Avifauna Impacts

The following potential impacts have been identified for the proposed wind energy facility development and will be further investigated in the EIA phase of the avifaunal assessment.

Table 39: Impacts associated with displacement of priority avifauna due to disturbance during construction phase

IMPACT TABLE 1	
Environmental Parameter	Avifauna
Issue/Impact/Environmental Effect/Nature	Displacement of priority species due to disturbance during **construction** phase
Extent	The impact will only affect the site.
Probability	Impact will certainly occur (greater than a 75% chance of occurrence) for some species, particularly the larger ones.
Reversibility	Partly reversible. The construction activities will inevitably cause temporary displacement of some priority species. Once the source of the disturbance has been removed, i.e. the noise and movement associated with the construction activities, most species should re-colonise the areas which have not been transformed by the footprint. However, the indirect effect of habitat fragmentation could result in lower densities of priority species.
Irreplaceable loss of resources	Marginal loss of resources. The displacement of priority species is likely to be partial.
Duration	Short term. Once the source of the disturbance has been removed, i.e. the noise and movement associated with the construction activities, priority species should re-colonise the areas which have not been transformed by the footprint, albeit possibly at a lower density.
Cumulative effect	Medium cumulative impact. The priority species that occur (or are likely to occur) at the proposed site all have large distribution ranges, the cumulative impact of displacement would therefore be locally significant, rather than regionally or nationally significant.

IMPACT TABLE 1		
Intensity/magnitude	High. Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease.	
Significance Rating	Medium significance.	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	4	2
Reversibility	2	1
Irreplaceable loss	2	2
Duration	1	1
Cumulative effect	3	2
Intensity/magnitude	3	2
Significance rating	-39 (medium negative)	-18 (low negative)
Mitigation measures	• Restrict the construction activities to the construction footprint area. • Do not allow any access to areas outside of the construction footprint area during the construction period. • Measures to control noise and dust should be applied according to current best practice in the industry. • Maximum use should be made of existing access roads and the construction of new roads should be kept to a minimum. • Implement a 3km no development buffer zone around the Verreaux's eagle nest at 29°52'56.53"S 22°33'19.06"E. • Implement a 200m no development buffer zone around the Southern pale Chanting Goshawk nest at 29°56'34.42"S 22°32'55.35"E. • Implement appropriate buffer zones around all priority species nest which are recorded in the course of the pre-construction monitoring.	

Table 40: Impacts associated with the displacement of priority species due to habitat destruction during construction phase.

IMPACT TABLE 2	
Environmental Parameter	Avifauna

IMPACT TABLE 2		
Issue/Impact/Environmental Effect/Nature	Displacement of priority species due to habitat destruction during **construction** phase	
Extent	The impact will only affect the site.	
Probability	Impact will certainly occur (greater than a 75% chance of occurrence)	
Reversibility	Partly reversible. The footprint of the wind farm is an inevitable result of the development, but it is likely that priority species will still utilise the site, albeit at lower densities.	
Irreplaceable loss of resources	Marginal loss of resources. It is likely that priority species will still utilise the site albeit at lower densities.	
Duration	Long term. The habitat transformation will be permanent	
Cumulative effect	Medium cumulative impact. There are several renewable energy developments planned around Copperton which will result in a significant area of transformed habitat at a local scale.	
Intensity/magnitude	Medium. It is likely that priority species will still utilise the site albeit at lower densities.	
Significance Rating	Medium significance.	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	4	3
Reversibility	2	2
Irreplaceable loss	2	2
Duration	4	4
Cumulative effect	3	3
Intensity/magnitude	2	2
Significance rating	-32 (medium negative)	-30 (medium negative)
Mitigation measures	• The recommendations of the specialist ecological study must be strictly adhered to. • Maximum use should be made of existing access roads and the construction of new roads should be kept to a minimum.	

Table 41: Impacts associated with the Avifauna displacement of priority species due to disturbance during operational phase

IMPACT TABLE 3		
Environmental Parameter	Avifauna	
Issue/Impact/Environmental Effect/Nature	Displacement of priority species due to disturbance during **operational** phase	
Extent	The impact will only affect the site.	
Probability	Probable. The impact may occur (between a 50% to 75% chance of occurrence).	
Reversibility	Partly reversible. The operational activities could cause displacement of some priority species, but the impact is likely to be much less than during the construction phase.	
Irreplaceable loss of resources	Marginal loss of resources. Habituation is likely for some species after the construction phase, especially smaller species.	
Duration	Long term. Although habituation may happen in some instances, it must be assumed that in some instances the impact may be long term i.e. for the life-time of the activity.	
Cumulative effect	Medium cumulative impact. The priority species that occur (or are likely to occur) at the proposed site all have large distribution ranges, the cumulative impact of displacement would therefore be locally significant, rather than regional or national.	
Intensity/magnitude	Medium. Although habituation may happen in some instances, it must be assumed that in some instances the impact may be long term i.e. for the life-time of the activity.	
Significance Rating	Low significance.	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	3	2
Reversibility	2	2
Irreplaceable loss	2	2
Duration	3	3
Cumulative effect	2	2
Intensity/magnitude	2	2
Significance rating	-26 (low negative)	-24 (low negative)
Mitigation measures	• Operational activities should be restricted to the plant area. Maintenance staff should not be allowed to access other parts of the property unless it is necessary for wind farm related work.	

IMPACT TABLE 3	
	• Post-construction monitoring should be implemented to make comparisons with baseline conditions possible. • If densities of key priority species are proven to be significantly reduced due to the operation of the wind farm, the management of the wind farm must be engaged to devise ways of reducing the impact on these species.

Table 42: Impacts associated with collisions of priority species with the turbines in the operational phase.

IMPACT TABLE 4		
Environmental Parameter	Avifauna	
Issue/Impact/Environmental Effect/Nature	Collisions of priority species with the turbines in the operational phase	
Extent	The impact will affect the local area or district	
Probability	Definite. More than 75% chance of occurrence.	
Reversibility	Partly reversible. Mitigation measures could reduce the risk of collisions.	
Irreplaceable loss of resources	Significant loss of resources.	
Duration	Long term. The risk of collision will be present for the life-time of the development.	
Cumulative effect	Medium to high cumulative impact. The cumulative impact will depend largely on which species are killed. If Verreaux's Eagles are killed, the regional impact will be significant.	
Intensity/magnitude	Medium. The wind turbines could cause mortality of some priority species.	
Significance Rating	High significance.	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	2	2
Probability	4	2
Reversibility	2	2
Irreplaceable loss	3	3
Duration	3	3
Cumulative effect	3	3
Intensity/magnitude	3	2

IMPACT TABLE 4		
Significance rating	-51 (high negative)	-30 (medium negative)
Mitigation measures	• Pre-construction monitoring should be implemented to guide the micro-siting of the turbines. • Once the turbines have been constructed, post-construction monitoring should be implemented to compare actual collision rates with predicted collision rates. • If actual collision rates indicate high mortality levels, curtailment of selective turbines should be implemented. • A 200m no-development zone is recommended around all water points. • A 3km no development buffer zone around the Verreaux's eagle nest at 29°52'56.53"S 22°33'19.06"E is recommended.	

6.2.3 Bat Impacts

The following potential impacts have been identified for the proposed wind energy facility development and will be further investigated in the EIA phase of the surface water assessment.

Table 43: Impacts on local bat diversity and population structures

IMPACT TABLE FORMAT	
Environmental Parameter	Local bat diversity and population structures
Issue/Impact/Environmental Effect/Nature	Artificial lighting at storage yards and other facilities in the area of the site will ecologically favour bat species that readily forage around lights above species that avoid lights, thereby altering local population structures and diversity. This is due to insect food resources being drawn out of natural habitats to lighted areas.
Extent	Site
Probability	Probable
Reversibility	Completely reversible
Irreplaceable loss of resources	No. Bat population structures should be able to recover after the construction phase.
Duration	Short term. For the duration of the construction phase.
Cumulative effect	Medium. Assuming other wind energy facilities in the larger area also have artificial lighting.

IMPACT TABLE FORMAT		
Intensity/magnitude	Medium	
Significance Rating	Low negative.	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	3	2
Reversibility	1	1
Irreplaceable loss	1	1
Duration	1	1
Cumulative effect	3	1
Intensity/magnitude	2	1
Significance rating	-20 (low negative)	-7 (low negative)
Mitigation measures	Use permanent lighting only where absolutely necessary for safety/security reasons. Other lights should be used with passive motion sensors and/or only switched on when needed. Utilise wavelengths/colour temperatures that attract less insects.	

Table 44: Impacts on vegetation utilised as foraging habitat by bats

IMPACT TABLE FORMAT		
Environmental Parameter	Vegetation utilised as foraging habitat by bats	
Issue/Impact/Environmental Effect/Nature	Foraging habitat will be lost where areas need to be cleared of natural vegetation for turbines and associated infrastructure	
Extent	Site	
Probability	Definite	
Reversibility	Barely reversible	
Irreplaceable loss of resources	Marginal	
Duration	Long term. For the lifetime of the facility.	
Cumulative effect	Medium.	
Intensity/magnitude	Low. The actual footprint of the facility is small in relation to the larger study area.	
Significance Rating	Low negative.	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1

IMPACT TABLE FORMAT		
Probability	4	3
Reversibility	3	3
Irreplaceable loss	2	2
Duration	3	3
Cumulative effect	3	2
Intensity/magnitude	1	1
Significance rating	-16 (low negative)	-14 (low negative)
Mitigation measures	Adhere to bat sensitivity maps.	

Table 45: Impacts on foraging bats

IMPACT TABLE FORMAT		
Environmental Parameter	Foraging bats	
Issue/Impact/Environmental Effect/Nature	Bat mortalities can occur with operating turbines due to direct blade impact or barotrauma. This impact is considering foraging bats	
Extent	District	
Probability	Probable	
Reversibility	Partly reversible	
Irreplaceable loss of resources	Significant loss. Bat populations can be slow to recover, and bat activity is very high during certain summer months.	
Duration	Long term. For the lifetime of the facility.	
Cumulative effect	High. As it is expected that the elevated bat activity occurring during certain summer months, are due to bats spreading from the Orange River to surrounding areas including the study site. Thus bats killed on site may affect agricultural activities in the Prieska area.	
Intensity/magnitude	High	
Significance Rating	High negative.	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	2	2
Probability	3	2
Reversibility	2	2
Irreplaceable loss	3	2
Duration	3	3

IMPACT TABLE FORMAT		
Cumulative effect	4	3
Intensity/magnitude	3	2
Significance rating	-51 (high negative)	-28 (low negative)
Mitigation measures	Apply operational mitigation such as curtailment, deterrents, and any other proven effective measures should the preconstruction bat monitoring confirm that there are periods of high bat activity on the site and that losses would be unsustainble.	

Table 46: Impacts on migrating bats

IMPACT TABLE FORMAT		
Environmental Parameter	Migrating bats	
Issue/Impact/Environmental Effect/Nature	Bat mortalities can occur with operating turbines due to direct blade impact or barotrauma. This impact is considering migrating bats	
Extent	Provincial	
Probability	Unlikely	
Reversibility	Partly reversible	
Irreplaceable loss of resources	Significant loss. Bat populations can be slow to recover, and large numbers of bats can be killed in a short time span.	
Duration	Long term. For the lifetime of the facility.	
Cumulative effect	High. Since migrating bats being killed will affect other regions apart from the site that can even be in other provinces. Migrating insect eating bats are also cave dwelling, therefore cave ecosystems dependant on their guano will be adversely affected if large numbers of the migrating colony is killed.	
Intensity/magnitude	Medium	
Significance Rating	Medium negative.	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	3	3
Probability	1	1
Reversibility	2	2
Irreplaceable loss	3	2
Duration	3	3
Cumulative effect	4	3
Intensity/magnitude	2	2
Significance rating	-32 (medium negative)	-28 (low negative)

IMPACT TABLE FORMAT	
Mitigation measures	Apply operational mitigation such as curtailment, deterrents, and any other proven effective measures during migration periods determined by the bat assessment or by data thereafter.

Table 47: Impacts on foraging bats. Local bat diversity and population structures

IMPACT TABLE FORMAT		
Environmental Parameter	Foraging bats. Local bat diversity and population structures.	
Issue/Impact/Environmental Effect/Nature	Artificial lighting close to turbines or at the turbine base will attract insects and therefore attract insect eating bats. This will significantly increase the likelihood of bats being killed by operating turbines. Additionally, it can ecologically favour bat species that readily forage around lights above species that avoid lights, thereby altering local population structures and diversity.	
Extent	Site	
Probability	Probable	
Reversibility	Partly reversible	
Irreplaceable loss of resources	Significant loss. Bat populations can be slow to recover, and bat activity is very high during certain summer months.	
Duration	Long term. For the duration of the facility.	
Cumulative effect	High. Assuming other wind energy facilities in the larger area also have artificial lighting.	
Intensity/magnitude	High	
Significance Rating	High negative.	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	3	1
Reversibility	2	2
Irreplaceable loss	3	2
Duration	3	3
Cumulative effect	4	3
Intensity/magnitude	3	2
Significance rating	-48 (high negative)	-24 (low negative)
Mitigation measures	Use permanent lighting only where absolutely necessary for safety/security reasons. Other lights should be used with passive	

IMPACT TABLE FORMAT	
	motion sensors and/or only switched on when needed. Utilise wavelengths/colour temperatures that attract less insects.

6.2.4 Surface Water Impacts

The following potential impacts have been identified for the proposed wind energy facility development and will be further investigated in the EIA phase of the surface water assessment.

Table 48: Impacts associated with the Construction Lay-down Area directly in Surface Water Resources

IMPACT TABLE		
Environmental Parameter	Surface water resources	
Issue/Impact/Environmental Effect/Nature	Impacts associated with the construction lay-down area directly in surface water resources	
Extent	Site	
Probability	Possible	
Reversibility	Partly reversible	
Irreplaceable loss of resources	Marginal loss of resources	
Duration	Medium term	
Cumulative effect	Low cumulative Impact	
Intensity/magnitude	Medium	
Significance Rating	Pre-mitigation significance rating is low and negative. With appropriate mitigation measures, the potential impact can be reduced greatly.	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	2	1
Reversibility	2	1
Irreplaceable loss	2	1
Duration	2	1
Cumulative effect	2	1
Intensity/magnitude	2	1
Significance rating	- 22 (low negative)	- 6 (low negative)
Mitigation measures	**Location of the Lay-down Area** – The location of the lay-down area must not be within 50m of any of the identified surface water resources. Additionally, materials and machinery must be kept away from surface water resources as far as practically possible.	

	Preventing Fire Risks – Operational fire extinguishers are to be available in the case of a fire emergency. Given the dry seasons that the study site experiences, it is recommended that a fire management and emergency plan compiled by a suitably qualified health and safety officer be compiled and implemented for the proposed development.

Table 49: Impact Rating for Construction Vehicle and Machinery Degradation Impacts to Surface Water Resources

IMPACT TABLE		
Environmental Parameter	Surface water resources	
Issue/Impact/Environmental Effect/Nature	Vehicle and machinery degradation to surface water resources	
Extent	Site	
Probability	Probable	
Reversibility	Partly reversible	
Irreplaceable loss of resources	Marginal loss of resources	
Duration	Medium term	
Cumulative effect	Medium cumulative Impact	
Intensity/magnitude	Medium	
Significance Rating	Pre-mitigation significance rating is low and negative. With appropriate mitigation measures, the impact can be reduced.	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	3	1
Reversibility	2	1
Irreplaceable loss	2	1
Duration	2	1
Cumulative effect	3	1
Intensity/magnitude	2	1
Significance rating	- 26 (low negative)	- 6 (low negative)
Mitigation measures	**Preventing Physical Degradation of Surface Water Resources** – Surface water resources are to be designated as “highly sensitive areas”. Vehicle access must avoid, where possible, these sensitive areas. Should internal access roads be routed in a surface water resources a water use license will be required before construction takes place and all mitigation measures are to be implemented accordingly.	

	Limiting Damage to Surface Water Resources – Ideally, to minimise any impact to surface water resources, the proposed development (including buildings, wind turbines and all associated infrastructure) should seek to avoid all surface water resources as far as possible. Where this is not possible a single access route or "Right of Way" (RoW) is to be established through or in the desired construction area in the surface water resource(s). The establishment of the RoW likewise must be demarcated and made visible. The width of the RoW must be limited to the width of the vehicles required to enter the surface water resource. An area around the locations of the proposed development buildings, wind turbines and any other associated infrastructure will be required in order for construction vehicles and machinery to operate/manoeuvre, only where required. This too must be limited to the smallest possible area and made visible by means of demarcation. Construction workers are only allowed in the designated construction areas of the proposed development and not into the surrounding surface water resources. Highly sensitive areas are to be clearly demarcated prior to the commencement of construction. **Preventing Soil Contamination** –Only authorised vehicles should be allowed into the highly sensitive areas. Vehicles that have oil, fuel or any other fluid leaks, are not to be allowed into surface water resources. All vehicles and machinery must be regularly serviced and maintained, and routinely checked for leakages. No fuelling, re-fuelling, vehicle and machinery servicing or maintenance is to take place in the highly sensitive areas. The study site is to contain sufficient spill contingency measures throughout the construction process. These include, but are not limited to, oil spill kits to be available, fire extinguishers, fuel, oil or hazardous substances storage areas must be bunded to prevent

	oil or fuel contamination of the ground and/or nearby surface water resources.

Table 50: Impact Rating for Human Degradation of Flora and Fauna associated with Surface Water Resources

IMPACT TABLE		
Environmental Parameter	Surface water resources	
Issue/Impact/Environmental Effect/Nature	Human degradation to fauna and flora associated with surface water resources	
Extent	Site	
Probability	Probable	
Reversibility	Completely reversible	
Irreplaceable loss of resources	Marginal loss of resources	
Duration	Short term	
Cumulative effect	Low cumulative impact	
Intensity/magnitude	Low	
Significance Rating	Pre-mitigation significance rating is low and negative. With appropriate mitigation measures, the impact can be further reduced.	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	3	1
Reversibility	1	1
Irreplaceable loss	2	1
Duration	1	1
Cumulative effect	2	1
Intensity/magnitude	1	1
Significance rating	- 10 (low negative)	- 6 (low negative)
Mitigation measures	**Minimising Human Physical Degradation of Sensitive Areas** – Construction workers are only allowed in designated construction and RoW areas. The highly sensitive areas are to be clearly demarcated no access into these areas are to be allowed unless authorised. No animals on the construction site or surrounding areas are to be hunted, captured, trapped, removed, injured, killed or eaten. Should any party be found guilty of such an offence, stringent penalties should be imposed. The appointed Environmental Control Officer	

	is to be contacted should removal of any fauna be required during the construction phase. No “long drop” toilets are allowed on the study site. Suitable temporary chemical sanitation facilities are to be provided. Temporary chemical sanitation facilities must be placed at least 100 meters from any surface water resource(s) where required. Temporary chemical sanitation facilities must be placed over a bunded or a sealed surface area and adequately maintained to prevent pollution impacts. No water is to be extracted unless a water use license is granted for specific quantities for a specific water resource. No hazardous or building materials are to be stored or brought into the highly sensitive areas. Should a designated storage area be required, the storage area must be placed at the furthest location from the highly sensitive areas. Appropriate safety measures as stipulated above must be implemented. No cement mixing is to take place in a surface water resource.

Table 51: Impact Rating for Degradation and Removal of Vegetation and Soils associated with Surface Water Resources

IMPACT TABLE	
Environmental Parameter	Surface water resources
Issue/Impact/Environmental Effect/Nature	Degradation and removal of soils and vegetation associated with surface water resources
Extent	Site
Probability	Possible
Reversibility	Barely reversible
Irreplaceable loss of resources	Marginal loss of resources
Duration	Long term
Cumulative effect	Medium cumulative Impact
Intensity/magnitude	Medium
Significance Rating	Pre-mitigation significance rating is low and negative. With appropriate mitigation measures, the impact can be further reduced.

	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	2	1
Reversibility	3	1
Irreplaceable loss	2	1
Duration	3	1
Cumulative effect	3	1
Intensity/magnitude	3	1
Significance rating	- 42 (medium negative)	- 6 (low negative)
Mitigation measures	**Strategic Positioning of Wind Turbines, Buildings and other Infrastructure** – Preferably all wind turbines, buildings and infrastructure should be placed at least 50m from any surface water resource as far as practically possible. This will significantly reduce the potential impact on surface water resources. Where this is not possible, more intense mitigation measures will be required as stipulated below. **Obtaining Relevant Authorisations and Licenses** – Before any construction or removal of soils and vegetation in any delineated surface water resources is undertaken, the relevant water use license is to be obtained and conditions adhered to. **Limiting Damage to Surface Water Resources** – Construction must be limited to the authorized RoW areas where applicable. **Limiting Removal of Excavated Soils** – Excavated topsoils should be stockpiled separately from subsoils so that it can be replaced in the correct order for rehabilitation purposes post-construction. Soils removed from surface water resources must only be removed if absolutely required. The topsoil is to be used for rehabilitation purposes and should not be removed unless there is surplus that cannot be utilised. It is important that when the soils are re-instated, the subsoils are to be backfilled first followed by the topsoil. The topsoil contains the natural seedbank from which the affected surface water resources or the associated buffer zone can naturally rehabilitate.	

	Where the soils are excavated from the sensitive areas, it is preferable for them to be stockpiled adjacent to the excavation pit to limit vehicle and any other movement activities around the excavation areas. **Preventing Pollution Impacts** – Any cement mixing in a surface water resource should take place over a bin lined (impermeable) surface or alternatively in the load bin of a vehicle to prevent the mixing of cement with the ground of the surface water resource. Importantly, no mixing of cement directly on the surface is allowed in the construction and RoW areas in surface water resources. **Protection of Stockpiled Soils** – Stockpiled soils, removed from a surface water resource, will need to be protected from wind and water erosion. Stockpiled soils, removed from a surface water resource, are not to exceed a 3m height and are to be bunded by suitable materials. Stacked bricks surrounding the stockpiled soils can be adopted. Alternatively, wooden planks pegged around the stockpiled soils can be used. **Rehabilitation of RoW Areas** – Ideally, the affected RoW zones in the sensitive areas must be re-instated with the soils removed from the surface water resource(s), and the affected areas must be levelled, or appropriately sloped and scarified to loosen the soil and allow seeds contained in the natural seed bank to re-establish. However, given the aridity of the study area, it is likely that vegetation recovery will be slow. Rehabilitation areas will need to be monitored for erosion until vegetation can re-establish where prevalent. If affected areas are dry and no vegetation is present, the soil is to be re-instated and sloped.

Table 52: Impact Rating for Increased Storm Water Run-off, Erosion and Sedimentation Impacts

IMPACT TABLE	
Environmental Parameter	Surface water resources
Issue/Impact/Environmental Effect/Nature	Increased storm water run-off, erosion and increased sedimentation impacting on surface water resources

Extent	Site	
Probability	Probable	
Reversibility	Partly reversible	
Irreplaceable loss of resources	Marginal loss of resources	
Duration	Medium term	
Cumulative effect	Medium cumulative impact	
Intensity/magnitude	Medium	
Significance Rating	Pre-mitigation significance rating is low and negative. With appropriate mitigation measures, the impact can be further reduced.	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	3	1
Reversibility	2	1
Irreplaceable loss	2	1
Duration	2	1
Cumulative effect	3	1
Intensity/magnitude	2	1
Significance rating	- 26 (low negative)	- 6 (low negative)
Mitigation measures	**Preventing Increased Run-off and Sedimentation Impacts** – Vegetation clearing should take place in a phased manner, only clearing areas that will be constructed on immediately. Vegetation clearing must not take place in areas where construction will only take place in the distant future. An appropriate storm water management plan formulated by a suitably qualified professional must accompany the proposed development to deal with increased run-off in the designated construction areas. In general, adequate structures must be put into place (temporary or permanent where necessary in extreme cases) to deal with increased/accelerated run-off and sediment volumes. The use of silt fencing and potentially sandbags or hessian "sausage" nets can be used to prevent erosion in susceptible construction areas. Grass blocks on the perimeter of the wind turbine hard stand areas and building structure footprints can also be used to reduce run-off and onset of erosion. Where required more permanent structures such as attenuation ponds and gabions can be constructed if needs be, however this is unlikely given	

	the study area. All impacted areas are to be adequately sloped to prevent the onset of erosion.

Table 53: Impact of Vehicle Damage to Surface Water Resources

IMPACT TABLE		
Environmental Parameter	Surface water resources	
Issue/Impact/Environmental Effect/Nature	Vehicle damage to surface water resources	
Extent	Local	
Probability	Possible	
Reversibility	Partly reversible	
Irreplaceable loss of resources	Marginal loss of resources	
Duration	Long term	
Cumulative effect	Medium cumulative impact	
Intensity/magnitude	High	
Significance Rating	Pre-mitigation significance rating is medium and negative. With appropriate mitigation measures, the impact can be reduced to a low negative impact.	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	2	1
Probability	2	1
Reversibility	2	1
Irreplaceable loss	2	1
Duration	3	3
Cumulative effect	3	1
Intensity/magnitude	3	1
Significance rating	- 42 (medium negative)	- 8 (low negative)
Mitigation measures	**Minimising Vehicle Damage to the Surface Water Resources** – Potential impacts can be avoided by the planning and routing of access / service roads outside of and away from surface water resources. Where access through surface water resources are unavoidable and are absolutely required, it is recommended that any road plan and associated structures (such as stormwater flow pipes, culverts, culvert bridges etc.) be submitted to the relevant environmental and water departments for approval prior to construction. Access and services roads authorised in sensitive areas will have to be regularly monitored and checked for erosion. Monitoring should be conducted once	

	every two months. Moreover, after short or long periods of heavy rainfall or after long periods of sustained rainfall the roads will need to be checked for erosion. Rehabilitation measures will need to be employed should erosion be identified. Where erosion begins to take place, this must be dealt with immediately to prevent significant erosion damage to the surface water resources. Should large scale erosion occur, a rehabilitation plan will be required. Input, reporting and recommendations from a suitably qualified engineer/wetland/surface water specialist must be obtained in this respect should this be required.

Table 54: Storm-water Run-off Impacts to Surface Water Resources

IMPACT TABLE		
Environmental Parameter	Surface water resources	
Issue/Impact/Environmental Effect/Nature	Impermeable and hardened surfaces creating accelerated run-off, consequent erosion and sedimentation	
Extent	Site	
Probability	Probable	
Reversibility	Partly reversible	
Irreplaceable loss of resources	Marginal loss of resource	
Duration	Long term	
Cumulative effect	Medium cumulative impact	
Intensity/magnitude	Medium	
Significance Rating	Pre-mitigation significance rating is low and negative. With appropriate mitigation measures, the impact can be reduced.	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	3	2
Reversibility	2	2
Irreplaceable loss	2	2
Duration	3	3
Cumulative effect	3	1
Intensity/magnitude	2	1
Significance rating	-28 (low negative)	-11 (low negative)

Mitigation measures	Any hardstand area or building within 50m proximity to a surface water resource must have energy dissipating structures in an appropriate location to prevent increased run-off entering adjacent areas or surface water resources. This can be in the form of hard concrete structures or soft engineering structures (such as grass blocks for example). Alternatively, a suitable operational storm water management design or plan can be compiled and implemented that accounts for the use of appropriate alternative structures or devices that will prevent increased run-off and sediment entering adjacent areas or surface water resources.

6.2.5 Soils and Agricultural Potential Impacts

The following potential impacts have been identified for the proposed wind power facility development and will be further investigated in the EIA phase of the soils and agricultural potential assessment.

Table 55: Summary of potential impacts of loss of agriculturally productive land

LOSS OF AGRICULTURALLY PRODUCTIVE LAND		
Environmental Parameter	Soil resource	
Impact	Loss of agriculturally productive land	
Extent (E)	Site	
Probability (P)	Possible	
Reversibility (R)	Completely reversible	
Irreplaceable loss of resources (I)	Marginal	
Duration (D)	Medium term	
Cumulative effect (C)	Low	
Intensity/magnitude (M)	Medium, mainly due to low prevailing agricultural potential of area	
Significance Rating	Low negative.	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	2	2

LOSS OF AGRICULTURALLY PRODUCTIVE LAND		
Reversibility	2	2
Irreplaceable loss	1	1
Duration	2	2
Cumulative effect	2	2
Intensity/magnitude	2	2
Significance rating	**-20 (low negative)**	**-20 (low negative)**
Mitigation measures	These would include: ensuring that the minimum area possible is set aside for the project infrastructure, so that as much existing vegetation as possible is not disturbed by the project and grazing of livestock can continue on site post-construction.	

Table 56: Summary of potential impacts of increased potential for erosion of topsoil by wind

INCREASED POTENTIAL FOR EROSION OF TOPSOIL BY WIND		
Environmental Parameter	Soil resource	
Impact	Increased potential for erosion of topsoil by wind	
Extent (E)	Local area	
Probability (P)	Probable	
Reversibility (R)	Partly reversible	
Irreplaceable loss of resources (I)	Marginal	
Duration (D)	Medium term	
Cumulative effect (C)	Medium, as wind-blown sediments can travel long distances	
Intensity/magnitude (M)	Potentially high, due to the dry climate and sandy nature of many of the topsoils in the area	
Significance Rating	Medium negative without mitigation measures, but low negative if mitigation measures are implemented. .	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	2	1
Probability	3	2
Reversibility	2	1
Irreplaceable loss	2	1
Duration	3	2
Cumulative effect	3	2
Intensity/magnitude	3	2
Significance rating	**-45 (medium negative)**	**-18 (low negative)**
Mitigation measures	Protection of the vegetation covering is vital, so that as little vegetation as possible to be removed. If bare topsoil results, it	

INCREASED POTENTIAL FOR EROSION OF TOPSOIL BY WIND	
	should be covered by a soil protection layer, such as a geotextile, to stabilize the site until vegetation can re-establish.

6.2.6 Noise Impacts

The following potential impacts have been identified for the proposed wind energy facility development and will be further investigated in the EIA phase of the visual assessment.

Table 57: Summary of potential impacts of noise during construction

IMPACT TABLE 1		
Environmental Parameter	Noise	
Issue/Impact/Environmental Effect/Nature	Temporary loss of "quiet" low residual noise level during construction phase for residential area within the wind energy facility boundaries.	
Extent	The impact will only affect residences on site.	
Probability	Impact will likely occur.	
Reversibility	Completely reversible. Construction noise ceases once infrastructure is in place.	
Irreplaceable loss of resources	Marginal loss of "quiet" environment.	
Duration	Short term. Construction noise ceases once infrastructure is in place.	
Cumulative effect	Low cumulative impact. Construction noise ceases once infrastructure is in place.	
Intensity/magnitude	Medium. Construction noise intrudes residential activities during daytime.	
Significance Rating	Medium significance.	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	3	2
Reversibility	1	1
Irreplaceable loss	2	1
Duration	1	1
Cumulative effect	2	1
Intensity/magnitude	2	1
Significance rating	-20 (low negative)	-7 (low negative)
Mitigation measures	▪ Construct access roads to avoid vehicle movements near residential area. ▪ Restrict the construction activities to daytime.	

Table 58: Summary of potential impacts of noise during operation

IMPACT TABLE 2		
Environmental Parameter	Noise	
Issue/Impact/Environmental Effect/Nature	Permanent loss of "quiet" low residual noise level during **operation phase** for residential areas within and beyond the wind energy facility boundaries.	
Extent	The impact will affect residences on site and beyond the site boundaries.	
Probability	Impact will definitely occur.	
Reversibility	Partly reversible. Dependent on separation distances between turbines and boundaries.	
Irreplaceable loss of resources	Significant loss of "quiet" environment particularly during night-time.	
Duration	Long term. Noise impact will continue for operational life of the development.	
Cumulative effect	High cumulative impact. Operational noise will significantly impair the well-being of residents.	
Intensity/magnitude	Very high. Operational noise will significantly impair the well-being of residents.	
Significance Rating	High significance.	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	2	1
Probability	4	2
Reversibility	2	1
Irreplaceable loss	3	1
Duration	3	1
Cumulative effect	4	1
Intensity/magnitude	4	1
Significance rating	-72(high negative)	-8 (low negative)
Mitigation measures	▪ Relocation of turbines to ensure separation distances to boundaries result in acceptable noise levels at residences and compliance with the Noise Control Regulations beyond the site boundaries. This will require detailed calculations during EIA phase based on noise emission data of the turbines to be provided by the client.	

6.2.7 Visual Impacts

The following potential impacts have been identified for the proposed wind energy facility development and will be further investigated in the EIA phase of the visual assessment.

Table 59: Rating of visual impacts of the proposed Aletta Wind Energy Facility during construction

IMPACT TABLE		
Environmental Parameter	Visual Impact	
Issue/Impact/Environmental Effect/Nature	Large construction vehicles and equipment during the construction phase will alter the natural character of the study area and expose visual receptors to visual impacts associated with the construction phase. The construction activities may be perceived as an unwelcome visual intrusion, particularly in more natural undisturbed settings. Vehicles and trucks travelling to and from the proposed site on gravel access roads are also expected to increase dust emissions. The increased traffic on gravel roads and the dust plumes could create a visual impact and may evoke negative sentiments from surrounding viewers. Surface disturbance during construction would also expose bare soil which could visually contrast with the surrounding environment. In addition, temporary stockpiling of soil during construction may alter the flat landscape. Wind blowing over these disturbed areas could result in dust which would have a visual impact.	
Extent	Local / District (2)	
Probability	Probable (3)	
Reversibility	Completely reversible (1)	
Irreplaceable loss of resources	No loss (1)	
Duration	Short term (1)	
Cumulative effect	Medium cumulative effects (3)	
Intensity/magnitude	Medium (2)	
Significance Rating	**Prior to mitigation measures:** Low negative impact **After mitigation measures:** Low negative impact	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	2	2
Probability	3	2
Reversibility	1	1
Irreplaceable loss	2	1

Duration	1	1
Cumulative effect	3	3
Intensity/magnitude	2	2
Significance rating	-24 (negative low)	-20 (negative low)
Mitigation measures	▪ Carefully plan to reduce the construction period. ▪ Minimise vegetation clearing and rehabilitate cleared areas as soon as possible. ▪ Maintain a neat construction site by removing rubble and waste materials regularly. ▪ Make use of existing gravel access roads where possible. ▪ Ensure that dust suppression techniques are implemented on all access roads, if deemed necessary.	

** Please note in the context of the visual environment 'resources' are defined as scenic / natural views that are almost impossible to replace.*

Table 60: Rating of visual impacts of the infrastructure associated with the Aletta Wind Energy Facility during construction

IMPACT TABLE	
Environmental Parameter	Visual Impact
Issue/Impact/Environmental Effect/Nature	Large construction vehicles and equipment during the construction of the underground cables, on-site 132kV substation, access roads and building infrastructure could exert a visual impact by altering the visual character of the surrounding area and exposing sensitive visual receptor locations to visual impacts associated with the construction phase. The construction activities may be perceived as an unwelcome visual intrusion, particularly in more natural undisturbed settings. Vehicles and trucks travelling to and from the proposed site on gravel access roads are also expected to increase dust emissions. The increased traffic on the gravel roads and the dust plumes could create a visual impact and may evoke negative sentiments from surrounding viewers. Surface disturbance during construction would also expose bare soil which could visually contrast with the surrounding environment. In addition, temporarily stockpiling soil during construction may alter the flat landscape. Wind blowing over these disturbed areas could result in dust which would have a visual impact.
Extent	Local/district (2)
Probability	Probable (3)
Reversibility	Completely reversible (1)

Irreplaceable loss of resources	No loss (1)	
Duration	Short term (1)	
Cumulative effect	Medium cumulative effects (3)	
Intensity/magnitude	Medium (2)	
Significance Rating	**Prior to mitigation measures:** Low negative impact **After mitigation measures:** Low negative impact	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	2	2
Probability	3	2
Reversibility	1	1
Irreplaceable loss	2	1
Duration	1	1
Cumulative effect	3	3
Intensity/magnitude	2	2
Significance rating	-24 (low negative)	-20 (low negative)
Mitigation measures	▪ All reinstated cable trenches should be re-vegetated with the same vegetation that existed prior to the cable being laid. ▪ Carefully plan to reduce the construction period. ▪ Minimise vegetation clearing and rehabilitate cleared areas as soon as possible. ▪ Maintain a neat construction site by removing rubble and waste materials regularly. ▪ Make use of existing gravel access roads where possible. ▪ Ensure that dust suppression techniques are implemented on all access roads, if deemed necessary.	

** Please note in the context of the visual environment 'resources' are defined as scenic / natural views that are almost impossible to replace.*

Table 61: Rating of visual impacts of the proposed Aletta Wind Energy Facility during operation

IMPACT TABLE		
Environmental Parameter	Visual Impact	
Issue/Impact/Environmental Effect/Nature	The proposed Aletta Wind Energy Facility could exert a visual impact by altering the visual character of the surrounding area and exposing sensitive visual receptor locations to visual impacts. The development may be perceived as an unwelcome visual intrusion, particularly in more natural undisturbed settings. Maintenance vehicles may need to access the wind energy facility via gravel access roads and are expected to increase dust emissions in doing so. The increased traffic on the gravel roads and the dust plumes could create a visual impact and may evoke negative sentiments from surrounding viewers. Security and operational lighting at the proposed wind energy facility could result in light pollution and glare, which could be an annoyance to surrounding viewers	
Extent	Local/district (2)	
Probability	Definite (4)	
Reversibility	Irreversible (4)	
Irreplaceable loss of resources	Marginal (2)	
Duration	Long term (3)	
Cumulative effect	Medium cumulative effects (2)	
Intensity/magnitude	Medium (2)	
Significance Rating	**Prior to mitigation measures:** Medium negative impact **After mitigation measures:** Medium negative impact	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	2	2
Probability	4	4
Reversibility	4	4
Irreplaceable loss	2	2
Duration	3	3
Cumulative effect	3	3
Intensity/magnitude	2	1
Significance rating	-36 (medium negative)	-18 (low negative)
Mitigation measures	▪ Light fittings for security at night should reflect the light toward the ground and prevent light spill.	

	▪ Ensure that dust suppression techniques are implemented on all access roads, if deemed necessary.

** Please note in the context of the visual environment 'resources' are defined as scenic / natural views that are almost impossible to replace.*

Table 62: Rating of visual impacts of the infrastructure associated with the Aletta Wind Energy Facility during operation

IMPACT TABLE		
Environmental Parameter	Visual Impact	
Issue/Impact/Environmental Effect/Nature	The proposed underground cables, on-site 132kV substation, access roads and building infrastructure could exert a visual impact by altering the visual character of the surrounding area and exposing sensitive visual receptors to visual impacts. The development may be perceived as an unwelcome visual intrusion, particularly in more natural undisturbed settings. Maintenance vehicles may need to access the infrastructure associated with the wind energy facility via gravel access roads and are expected to increase dust emissions in doing so. The increased traffic on the gravel roads and the dust plumes could create a visual impact and may evoke negative sentiments from surrounding viewers. Security and operational lighting at the associated infrastructure could result in light pollution and glare, which could be an annoyance to surrounding viewers	
Extent	Local / District (2)	
Probability	Probable (3)	
Reversibility	Irreversible (4)	
Irreplaceable loss of resources	Marginal loss of resources (2)	
Duration	Long term (3)	
Cumulative effect	Medium cumulative effects (2)	
Intensity/magnitude	Medium (2)	
Significance Rating	**Prior to mitigation measures:** Medium negative impact **After mitigation measures:** Low negative impact	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	2	2
Probability	3	3
Reversibility	4	4

Irreplaceable loss	2	1
Duration	3	3
Cumulative effect	3	2
Intensity/magnitude	2	1
Significance rating	-34(medium negative)	-15 (low negative)
Mitigation measures	▪ Light fittings for security at the on-site 132kV substation at night should reflect the light toward the ground and prevent light spill. ▪ Except for lighting that is necessary for security, the operations and maintenance buildings should not be illuminated at night. ▪ If overhead power lines are required, align power lines to run parallel to existing power lines and other linear impacts, where possible. ▪ Bury cables under the ground where possible. ▪ The operation and maintenance building should be painted with natural tones that fit with the surrounding environment. Non-reflective surfaces should be utilised where possible. ▪ Ensure that dust suppression techniques are implemented on all access roads, if deemed necessary. ▪ Select the alternatives that will have the least impact on visual receptors.	

** Please note in the context of the visual environment 'resources' are defined as scenic / natural views that are almost impossible to replace.*

6.2.8 Heritage Impacts

The following potential impacts have been identified for the proposed wind energy facility development and will be further investigated in the EIA phase of the heritage assessment.

Table 63: Rating of impacts – Archaeological sites

IMPACT TABLE	
Environmental Parameter	Heritage Resources – Archaeological resource
Issue/Impact/Environmental Effect/Nature	The possibility of encountering previously unidentified heritage resources and specifically Stone Age archaeological sites. As well as the impact on the identified archaeological sites
Extent	Will impact on the footprint area of the development
Probability	Fieldwork in the larger area, has shown that such a predicted impact will definitely occur

Reversibility	Due to the nature of archaeological sites the impact is seen as irreversible, however mitigation could enable the collection of enough information to preserve the data from such a site
Irreplaceable loss of resources	The development could lead to significant losses in unidentified and unmitigated site
Duration	The impact on heritage resources such as archaeological sites will be permanent
Cumulative effect	As the type of development impact on a large area, and other similar development in the area will also impact on archaeological sites the cumulative impact is seen as having a medium negative impact.
Intensity/magnitude	The large scale impact on archaeological sites and will require mitigation work.
Significance Rating	The overall significance rating for the impact on heritage resources is seen as high pre-mitigation. This can be attributed to the very definite possibility of encountering more archaeological sites as shown through fieldwork. The implementation of the recommended heritage mitigation measures will address the envisaged impacts and reduce the overall rating to a low impact rating.

	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	4	4
Reversibility	2	2
Irreplaceable loss	2	2
Duration	4	4
Cumulative effect	3	2
Intensity/magnitude	3	2
Significance rating	-51 (high negative)	-24 (low negative)
Mitigation measures	• Monitoring during construction by and archaeologist • Mitigation through archaeological excavations and collection • Walk down of final layout	

Table 64: Rating of impacts – Palaeontological resources

IMPACT TABLE	
Environmental Parameter	Heritage Resources – Palaeontological resources

Issue/Impact/Environmental Effect/Nature	The possibility of encountering previously unidentified fossils.	
Extent	Will impact on the footprint area of the development	
Probability	The fieldwork has shown that such a predicted impact will most probably not occur	
Reversibility	Due to the nature of fossils the impact is seen as irreversible, however mitigation could enable the collection of enough information to preserve the data from such a site	
Irreplaceable loss of resources	The development could lead to losses in unidentified and unmitigated fossils	
Duration	The impact on heritage resources such as palaeontological sites will be permanent	
Cumulative effect	As the type of development impact on a large area, and other similar development in the area will also impact on palaeontological sites the cumulative impact is seen as having a low negative impact.	
Intensity/magnitude	The large scale impact on palaeontological sites and may require mitigation work.	
Significance Rating	The overall significance rating for the impact on palaeontological resources is seen as medium pre-mitigation. This can be attributed to the very low possibility of encountering more fossil sites as shown through fieldwork. The implementation of the recommended heritage mitigation measures will address the envisaged impacts and reduce the overall rating to a low impact rating.	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	1	1
Reversibility	2	2
Irreplaceable loss	2	2
Duration	4	4
Cumulative effect	2	1
Intensity/magnitude	1	1
Significance rating	-12 (low negative)	-11 (low negative)
Mitigation measures	None required	

6.2.9 Socio-economic Impacts

The following potential impacts have been identified for the proposed wind energy facility and will be further investigated in the EIA phase of the socio-economic assessment.

Table 65: Impact of the increase in production of the national and local economies due to project capital expenditure

Environmental Parameter	Economic production is defined as any activity that uses inputs such as labour and capital to produce outputs in the form of services or goods.	
Issue/Impact/Environmental Effect/Nature	The impact takes place due to the investment on the project that will be spent in the country. Besides the direct impact, it involves the indirect and induced effects that are created when either suppliers of goods and services to the project experience an increase in demand or when businesses servicing households experience an increase in demand for their products.	
Extent	The national economy will experience an increase in production.	
Probability	It is most likely that there will be a temporary increase in production during construction.	
Reversibility	The impact is irreversible, as the capital spent on the project cannot be paid back.	
Irreplaceable loss of resources	No loss of resource.	
Duration	Short term	
Cumulative effect	High, as there are a number of planned renewable energy developments in the area.	
Intensity/magnitude	Considering multiplier effects, the total impact on the national economy's output could be more than three times more than the expenditure.	
Significance Rating	This is a positive high impact. Mitigation measures will maximise benefits to the local economy but will not change the significance of the rating.	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	4	4
Probability	3	3
Reversibility	4	4
Irreplaceable loss	1	1
Duration	1	1
Cumulative effect	3	3
Intensity/magnitude	4	4
Significance rating	+64(high positive)	+64 (high positive)
Mitigation measures	In order to optimise the stimulation of the local economy through direct, indirect, and induced effects, the following should be applied where possible:	

	▪ Procure construction materials, goods, and products from local suppliers if feasible. ▪ Employ local contractors where possible. The proposed mitigation measures will possibly increase the positive impact in the local economy; however, this will not affect the rating.

Table 66: Impact of the increase in GDP-R of the national and local economies due to project capital expenditure

Environmental Parameter	Gross domestic product (GDP) is the total value of all "final" goods and services, which were produced within the borders of the country during a year.	
Issue/Impact/Environmental Effect/Nature	The impact is generated through capital expenditure that shocks the economy. It results in growth of sectors that include businesses supplying goods and services required for the establishment of the facility and businesses that benefit from the increased consumer expenditure.	
Extent	The national economy will experience an increase in GDP-R.	
Probability	It is most likely that there will be a temporary increase in GDP-R during construction.	
Reversibility	The impact is irreversible, as the capital spent on the project cannot be paid back.	
Irreplaceable loss of resources	No loss of resource.	
Duration	Short term	
Cumulative effect	High, as there are a number of planned renewable energy developments in the area.	
Intensity/magnitude	There could be a significant increase in the country's GDP.	
Significance Rating	This is a positive medium impact. Mitigation measures will maximise benefits to the local economy but will not change the significance of the rating.	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	4	4
Probability	3	3
Reversibility	4	4
Irreplaceable loss	1	1
Duration	1	1
Cumulative effect	3	4
Intensity/magnitude	3	3
Significance rating	+48 (medium positive)	+48 (medium positive)
Mitigation measures	▪ Recruit local labour. ▪ Sub-contract to local construction companies if feasible.	

	▪ Use local suppliers where viable and arrange with the local Small and Medium Enterprises to provide transport, catering, and other services for the construction crew. The proposed mitigation measures will possibly increase the positive impact in the local economy; however, this will not affect the rating.

Table 67: Impact of creation of temporary employment in the local communities and elsewhere in the country

Environmental Parameter	Employment impacts are calculated in terms of the Full-Time Equivalent (FTE) employment positions, which is the same as a FTE job or one man-year of work.	
Issue/Impact/Environmental Effect/Nature	The impact is generated through capital expenditure that shocks the economy. It involves the creation of direct new job opportunities related to the construction of the proposed development and employment opportunities that will be indirectly created through the increased expenditure in sectors supplying goods and services to the construction activity and in sectors benefiting from the increase of consumer expenditure.	
Extent	Increase in employment will affect the entire country depending on the areas where inputs required are sourced.	
Probability	It is most likely that there will be a temporary increase in employment during construction.	
Reversibility	Irreversible as employment created, albeit for a temporary period, cannot be undone.	
Irreplaceable loss of resources	No loss of resource.	
Duration	Short term.	
Cumulative effect	High, as there are a number of planned renewable energy developments in the area.	
Intensity/magnitude	There will be a notable reduction in unemployment within the Siyathemba LM.	
Significance Rating	This is a positive high impact. Mitigation measures will maximise benefits to the local economy but will not change the significance of the rating.	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	4	4
Probability	3	3
Reversibility	4	4
Irreplaceable loss	1	1
Duration	1	1
Cumulative effect	3	3
Intensity/magnitude	3	3
Significance rating	+48 (medium positive)	+48 (medium positive)

Mitigation measures	▪ Employ labour-intensive measures in construction if possible. ▪ Employ local residents if possible. ▪ Sub-contract to local construction companies if possible. ▪ Utilise local suppliers if possible. ▪ Set-up a skills desk at the local municipal office and in the nearby communities to identify skills available in the community and assist in recruiting local labour during both construction and operation.

Table 68: Impact of skills development due to the creation of new employment opportunities

Environmental Parameter	Skills development: employment creation gives way to a host of skills transfer and development opportunities in terms of honing an existing skill or acquiring a new skill.	
Issue/Impact/Environmental Effect/Nature	The impact takes place during the creation of new employment opportunities, and unlike the actual employment created is sustainable.	
Extent	People across the country will have the opportunity to develop their skills.	
Probability	Possible – one cannot be certain that people gaining employment during the construction phase will be able to develop or acquire new skills.	
Reversibility	Barely reversible - skills obtained cannot be lost unless they are not being used and/or become outdated	
Irreplaceable loss of resources	No loss of resource.	
Duration	Short term.	
Cumulative effect	High, as there are a number of planned renewable energy developments in the area.	
Intensity/magnitude	High impact on local employees' skills – 39% of the employed people in Siyathemba LM are unskilled. In the context of the national economy, though this impact will be of a lower magnitude.	
Significance Rating	This is a medium positive impact.	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	4	4
Probability	2	3
Reversibility	3	3
Irreplaceable loss	1	1
Duration	1	1
Cumulative effect	3	3
Intensity/magnitude	3	3
Significance rating	+42 (medium positive)	+45 (medium positive)
Mitigation measures	▪ Contractors should provide learnerships and on-job training;	

	▪ Where specialist training can be provided, candidates from local communities should be prioritised for training; and ▪ Share knowledge with the sub-contracting companies during the construction period. These mitigation measures could potentially improve the weighting of the impact in terms of its probability.

Table 69: Impact of improved standard of living of households directly or indirectly benefiting from created employment opportunities

Environmental Parameter	Household income: the result of a household's member engaging in economic activity; has a direct link to the standard of living of these households.	
Issue/Impact/Environmental Effect/Nature	The impact takes place during construction as a result of jobs created through direct, indirect and induced impacts.	
Extent	Increase in household income will be nationwide since the temporary increase in employment will affect the entire country.	
Probability	Probable - the impact will most likely take place.	
Reversibility	Irreversible.	
Irreplaceable loss of resources	No loss of resource.	
Duration	Short term.	
Cumulative effect	High, as there are a number of planned renewable energy developments in the area.	
Intensity/magnitude	Possibly high – Income earned by households located in the local community as a result of a project is usually on average higher than the average income of these households. The impact within the national economy, though will be less significant.	
Significance Rating	This is a medium positive impact. Mitigation measures could increase the impact on the local economy but would not change the total impact. Therefore, the weights assigned for the impact before mitigations will not be affected.	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	4	4
Probability	3	3
Reversibility	4	4
Irreplaceable loss	1	1
Duration	1	1
Cumulative effect	3	3
Intensity/magnitude	3	3
Significance rating	+48 (medium positive)	+48 (medium positive)

Mitigation measures	▪ Recruit local labour as far as feasible to increase the benefits to the local households. ▪ Employ labour-intensive methods in construction if possible. ▪ Sub-contract to local construction companies if possible. ▪ Use local suppliers where viable and arrange with the local Small and Medium Enterprises to provide transport, catering, and other services for the construction crew.

Table 70: Impact of increase in government revenue due to investment

Environmental Parameter	Government revenue: government obtains its revenue by collecting taxes and rates from the country's residents and business.	
Issue/Impact/Environmental Effect/Nature	The impact will take place as a result of local expenditure on construction and will be acquired by government through indirect and direct taxes on the project's activity.	
Extent	The fiscal gain will be collected by the national government and used in the national budget; it is not possible to pinpoint exact regions benefitting from this increase.	
Probability	Definite - the impact will definitely take place, although one cannot be certain of the exact amount that government will be collecting as a result of this phase of the proposed project.	
Reversibility	Irreversible.	
Irreplaceable loss of resources	No loss of resource.	
Duration	Short term.	
Cumulative effect	High, as there are a number of planned renewable energy developments in the area.	
Intensity/magnitude	Low – the project will make a small contribution to the national revenue.	
Significance Rating	This is a low positive impact.	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	4	4
Probability	4	4
Reversibility	4	4
Irreplaceable loss	1	1
Duration	1	1
Cumulative effect	3	3
Intensity/magnitude	1	1
Significance rating	+17 (low positive)	+17 (low positive)
Mitigation measures	*No mitigations.*	

Table 71: Impact of the potential decrease of efficacy of agricultural land

Environmental Parameter	Land sterilisation: loss of land to new development.	
Issue/Impact/Environmental Effect/Nature	The impact will take place as a result of replacement of the low intensity farming activities.	
Extent	Will affect farms on which project will be developed.	
Probability	Definite - without the sale/lease of land the project will not go ahead	
Reversibility	Barely reversible.	
Irreplaceable loss of resources	Marginal loss of resources.	
Duration	Long-term.	
Cumulative effect	High, as there are a number of planned renewable energy developments in the area.	
Intensity/magnitude	Low – the intensity of agricultural activities is low.	
Significance Rating	The impact is low negative. Mitigation may reduce intensity of impact	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	3	2
Reversibility	3	3
Irreplaceable loss	2	2
Duration	3	3
Cumulative effect	3	3
Intensity/magnitude	1	1
Significance rating	-15 (low negative)	-15 (low negative)
Mitigation measures	▪ Reasonable compensation must be negotiated with the affected farmers. ▪ Should resettlement of farm workers be required, a Resettlement Action Plan must be developed and implemented. ▪ Implementation of rehabilitation measures.	

Table 72: Impact of social pathologies - social factors such as deterioration of health; increase in crime; prostitution; and drugs among others.

Environmental Parameter	Social pathologies - social factors such as deterioration of health; increase in crime; prostitution; and drugs among others.
Issue/Impact/Environmental Effect/Nature	Potential impacts on social factors associated with the presence of construction workers and job seekers.
Extent	The local community.
Probability	Probable.

Reversibility	Partly reversible. However, in the case of HIV and AIDS, the impact is irreversible.	
Irreplaceable loss of resources	This impact could be associated with some losses of personal goods and livestock.	
Duration	Short-term.	
Cumulative effect	High, as there are a number of planned renewable energy developments in the area.	
Intensity/magnitude	Low.	
Significance Rating	The impact is low negative.	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	2	2
Probability	3	2
Reversibility	2	2
Irreplaceable loss	2	2
Duration	1	1
Cumulative effect	3	3
Intensity/magnitude	1	1
Significance rating	-13 (low negative)	-12 (low negative)
Mitigation measures	The developers could implement the following measures to limit the occurrence of an increase in social pathologies: ▪ Employ locals as far as feasible through the creation of the local skills database and recruitment of suitable candidates. ▪ Set up a gate or access control to site to limit or completely eliminate the possibility of livestock theft and burglaries at the residential properties. ▪ Control the movement of workers between the site and areas of residence to minimise loitering. ▪ The contractors should make the necessary arrangements for allowing workers from outside the area to return home over weekends and/ or on a regular basis. This would reduce the risk posed to local family structures and social networks. ▪ Implementing health awareness campaigns to curb the potential of spreading disease, use of drugs, or alcohol abuse for example.	

Table 73: Impact of added pressure on basic services and social and economic infrastructure

Environmental Parameter	Basic services and social and economic infrastructure: this includes housing, water and sanitation, electricity, roads, clinics, recreational facilities

Issue/Impact/Environmental Effect/Nature	The influx of jobseekers to the area and migration of workers will increase the demand for basic services, as well as social and economic infrastructure in the area.	
Extent	The added pressure on infrastructure will be felt by the local municipality.	
Probability	Possible.	
Reversibility	This impact is partly reversible but will require significant investment to provide adequately for the area with a temporary increase in population and straining infrastructure.	
Irreplaceable loss of resources	This impact is not associated with any losses of resources; however, deterioration of man-made infrastructure is probable.	
Duration	Medium-term - impacts may last post the construction phase until mitigated.	
Cumulative effect	High, as there are a number of planned renewable energy developments in the area.	
Intensity/magnitude	Low - considering that there are no existing challenges with regards to basic service delivery.	
Significance Rating	The impact is low negative.	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	2	2
Probability	2	2
Reversibility	2	2
Irreplaceable loss	1	1
Duration	2	2
Cumulative effect	3	3
Intensity/magnitude	1	1
Significance rating	-12 (low negative)	-12 (low negative)
Mitigation measures	▪ Engage with local authorities and inform them of the development as well discuss with them the ability of the municipality to meet the demands for social and basic services created by the migrant construction workers. ▪ Where feasible, assist the municipality in ensuring that the quality of the local social and economic infrastructure does not deteriorate further (especially the local roads).	

Table 74: Impact of sustainable increase in production of the national and local economies through operation and maintenance activities

Environmental Parameter	Economic production is defined as any activity that uses inputs such as labour and capital to produce outputs in the form of services or goods.

Issue/Impact/Environmental Effect/Nature	The impact results from sustainable production of the wind facility, as well as procurement of goods and services required for its sustainable operations and creation of sustainable employment opportunities through direct and indirect effects.	
Extent	The national economy will experience an increase in production	
Probability	It is most likely that there will be an increase in production.	
Reversibility	The impact is irreversible.	
Irreplaceable loss of resources	No loss of resource.	
Duration	This impact is rated as long-term since it will be experienced over the entire operational life of the project.	
Cumulative effect	High, as there are a number of planned renewable energy developments in the area.	
Intensity/magnitude	Medium.	
Significance Rating	This is a positive medium impact. Mitigation measures will maximise benefits to the local economy but will not change the significance of the rating.	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	4	4
Probability	3	3
Reversibility	4	4
Irreplaceable loss	1	1
Duration	3	3
Cumulative effect	3	3
Intensity/magnitude	2	2
Significance rating	+36 (medium positive)	+36 (medium positive)
Mitigation measures	The project should aim to benefit the local economy as far as possible and feasible by opting for procurement of local goods and services. However, this will not affect the rating.	

Table 75: Impact of sustainable increase in GDP of the national and local economies through operation and maintenance activities

Environmental Parameter	Gross domestic product (GDP) is the total value of all "final" goods and services, which were produced within the borders of the country during a year.
Issue/Impact/Environmental Effect/Nature	The impact is generated through continuous operation of the wind facility. It stimulates economic activities of directly and indirectly affected businesses, which subsequently leads to the creation of new business sales and generation of value added. Through increased household expenditure, an additional round of value adding is created.
Extent	The national economy will experience an increase in GDP-R.
Probability	It is most likely that there will be an increase in GDP-R during operations.

Reversibility	The impact is irreversible.	
Irreplaceable loss of resources	No loss of resource.	
Duration	This impact is rated as long-term since it will be experienced over the entire operational life of the project.	
Cumulative effect	High, as there are a number of planned renewable energy developments in the area.	
Intensity/magnitude	Medium - The direct impact associated with the project will lead to the change in the local economy's structure but will have a diluted effect on the national economy.	
Significance Rating	This is a positive medium impact. Mitigation measures will maximise benefits to the local economy but will not change the significance of the rating.	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	4	4
Probability	3	3
Reversibility	4	4
Irreplaceable loss	1	1
Duration	3	3
Cumulative effect	3	3
Intensity/magnitude	2	2
Significance rating	+36 (medium positive)	+36 (medium positive)
Mitigation measures	▪ Investigate local procurement opportunities. ▪ Procurement from local suppliers should be encouraged if feasible to the viability of the facility.	

Table 76: Impact of the creation of long-term employment in local and national economies through operation and maintenance activities

Environmental Parameter	Employment impacts are calculated in terms of the Full-Time Equivalent (FTE) employment positions, which is the same as a FTE job or one man-year of work.
Issue/Impact/Environmental Effect/Nature	The project could create a significant number of jobs during its operations, and also create and support additional employment opportunities through multiplier effects.
Extent	Increase in employment will affect the entire country depending on the areas where inputs required are sourced.
Probability	It is most likely that there will be an increase in employment during operations.
Reversibility	The impact is irreversible.
Irreplaceable loss of resources	No loss of resource.
Duration	Long-term – the created employment opportunities are expected to last for the duration of the project.
Cumulative effect	High, as there are a number of planned renewable energy developments in the area.

Intensity/magnitude	Low – there will be some reduction in unemployment within the Siyathemba LM	
Significance Rating	This is a positive low impact. Mitigation measures will maximise benefits to the local economy but will not change the significance of the rating.	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	4	4
Probability	3	3
Reversibility	4	4
Irreplaceable loss	1	1
Duration	1	1
Cumulative effect	3	3
Intensity/magnitude	1	1
Significance rating	+16 (low positive)	+16 (low positive)
Mitigation measures	▪ Where possible, the employment of local labour should be practiced to increase the benefit to the local community through prevention of leakage of buying power. ▪ Local small businesses should also be approached to investigate the possibility of supplying inputs for maintenance and operations where viable, this should increase local indirect employment creation.	

Table 77: Impact of skills development due to the creation of new sustainable employment opportunities

Environmental Parameter	Skills development: employment creation gives way to a host of skills transfer and development opportunities in terms of honing an existing skill or acquiring a new skill.
Issue/Impact/Environmental Effect/Nature	The impact takes place through the creation of employment opportunities during operations, and unlike the actual employment created is sustainable.
Extent	People across the country will have the opportunity to develop their skills.
Probability	Possible – one cannot be certain that people gaining employment during the operational phase will be able to develop or acquire new skills.
Reversibility	Irreversible; skills once gained cannot be lost.
Irreplaceable loss of resources	No loss of resource.
Duration	Permanent – the skills transferred will remain after the life of the project
Cumulative effect	High, as there are a number of planned renewable energy developments in the area.
Intensity/magnitude	Impact is rated as being of low intensity due to the nature of skills required for the operations.
Significance Rating	This impact is given a significance rating of low positive. Enhancement measures exist that can be implemented to ensure

	that skills development does take place which would improve the probability rating of this impact.	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	4	4
Probability	2	3
Reversibility	4	4
Irreplaceable loss	1	1
Duration	4	4
Cumulative effect	3	3
Intensity/magnitude	1	1
Significance rating	+18 (low positive)	+19 (low positive)
Mitigation measures	In order to improve the chances of skills being developed during the operational period it is recommended that vocational skills transfer/training programmes be developed and knowledge sharing among employees encouraged. This mitigation measure could potentially improve the weighting of the impact in terms of its probability and increase it significance slightly.	

Table 78: Impact of improved standard of living of households directly or indirectly benefiting from created employment opportunities

Environmental Parameter	Household income: the result of a household's member engaging in economic activity; has a direct link to the standard of living of these households.	
Issue/Impact/Environmental Effect/Nature	The impact takes place during operations as a result of jobs created through direct, indirect and induced impacts	
Extent	Increase in household income will be nationwide since the sustainable increase in employment will affect the entire country	
Probability	Probable - the impact will most likely take place	
Reversibility	Irreversible.	
Irreplaceable loss of resources	No loss of resource.	
Duration	Long-term – the created employment opportunities are expected to last for the duration of the project.	
Cumulative effect	High, as there are a number of planned renewable energy developments in the area.	
Intensity/magnitude	Medium intensity	
Significance Rating	This is a medium positive impact. Mitigation measures could increase the impact on the local economy but would not change the total impact. Therefore, the weights assigned for the impact before mitigations will not be affected.	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	4	4
Probability	3	3
Reversibility	4	4

Irreplaceable loss	1	1
Duration	3	3
Cumulative effect	3	3
Intensity/magnitude	2	2
Significance rating	+36 (medium positive)	+36 (medium positive)
Mitigation measures	Local procurement of labour and required goods and services should be encouraged as far as feasible to increase the benefit to the local households. This, though, will not affect the overall rating.	

Table 79: Impact of increase in government revenue stream

Environmental Parameter	Government revenue: government obtains its revenue by collecting taxes and rates from the country's residents and business.	
Issue/Impact/Environmental Effect/Nature	The impact takes place mostly with payment of royalties and corporates taxes, as well as a result of payment of salaries and wages and declaration of dividends.	
Extent	The fiscal gain will be collected by the national government and used in the national budget; it is not possible to pinpoint exact regions benefitting from this increase.	
Probability	Definite - the impact will definitely take place, although one cannot be certain of the exact amount that government will be collecting as a result of this phase of the proposed project.	
Reversibility	Irreversible.	
Irreplaceable loss of resources	No loss of resource.	
Duration	Long-term	
Cumulative effect	High, as there are a number of planned renewable energy developments in the area.	
Intensity/magnitude	Low – the project will make a small contribution to the national revenue.	
Significance Rating	This is a low positive impact.	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	4	4
Probability	4	4
Reversibility	4	4
Irreplaceable loss	1	1
Duration	3	3
Cumulative effect	3	3
Intensity/magnitude	1	1
Significance rating	+19 (low positive)	+19 (low positive)
Mitigation measures	No mitigations.	

Table **80:** Impact of investment in the local communities and economic development projects as part of a Social Economic Development and Enterprise Development plan

Environmental Parameter	SED and ED initiatives; as part of the RE IPPP programme, project owners are required to spend a portion of their turnover on the upliftment of the community where the project is located.	
Issue/Impact/Environmental Effect/Nature	Currently the economic base of Siyathemba LM is small, and the anticipated injection will have a significant positive impact on the standard of living of its community.	
Extent	The impact will affect the local municipality; it is envisaged to be geared towards Copperton and nearby villages due to their proximity to the site but could potentially be extended in the future.	
Probability	Definite - the impact will definitely take place.	
Reversibility	Irreversible.	
Irreplaceable loss of resources	No loss of resource.	
Duration	Long-term – throughout the operational period	
Cumulative effect	High, as there are a number of planned renewable energy developments in the area.	
Intensity/magnitude	Low – the project will make an average contribution to the local economy.	
Significance Rating	Low positive impact.	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	2	2
Probability	4	4
Reversibility	4	4
Irreplaceable loss	1	1
Duration	3	3
Cumulative effect	3	3
Intensity/magnitude	1	1
Significance rating	+17 (low positive)	+17 (low positive)
Mitigation measures	It is recommended that the project owner develops practical SED and ED programmes throughout the project's lifespan. The plan should be developed in consultation with local authorities and existing strategy documents to identify community projects that would result in the greatest social benefits. With regard to ED initiatives, focus should be on developing plans to support and create sustainable, self-sufficient enterprises. It is important that these plans be reviewed annually and where possible updated.	

Table 81: Impact of altered sense of place

Environmental Parameter	Sense of place, living and working conditions: these conditions are influenced by a variety of factors and can be quite subjective as each factor has a varying degree of influence for each person depending on what each individual's values are.
Issue/Impact/Environmental Effect/Nature	Operation activities will have a significant visual impact on the areas in close proximity to the development site.

Extent	The biggest impact will be felt close to the project site.	
Probability	Definite - the impact will definitely take place.	
Reversibility	Completely reversible.	
Irreplaceable loss of resources	No loss of resource.	
Duration	Long-term – throughout the operational period	
Cumulative effect	High, as there are a number of planned renewable energy developments in the area.	
Intensity/magnitude	Low	
Significance Rating	Low negative impact.	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	4	4
Reversibility	1	1
Irreplaceable loss	1	1
Duration	3	3
Cumulative effect	3	3
Intensity/magnitude	1	1
Significance rating	-13 (low negative)	-13 (low negative)
Mitigation measures	The mitigation measures proposed by the visual specialist should be adhered to.	

6.2.10 Traffic Impacts

The following potential impacts have been identified for the proposed wind energy facility development and will be further investigated in the EIA phase of the traffic assessment.

Table 82: Summary of potential cumulative impacts on traffic during construction

IMPACT TABLE FORMAT	
Environmental Parameter	Traffic
Issue/Impact/Environmental Effect/Nature	Change to the LOS on a portion of the rural highway and on the existing local roadways.
Extent	Will affect the entire province or region.
Probability	The impact will likely occur.
Reversibility	The impact is reversible with implementation of minor mitigation measures.
Irreplaceable loss of resources	The impact will not result in the loss of any resources.
Duration	Short term. For the duration of the construction phase.
Cumulative effect	The impact would result in insignificant cumulative effects.

IMPACT TABLE FORMAT		
Intensity/magnitude	Medium	
Significance Rating	Low negative impact.	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	3	3
Probability	3	2
Reversibility	1	1
Irreplaceable loss	1	1
Duration	1	1
Cumulative effect	1	1
Intensity/magnitude	2	2
Significance rating	-20 (low negative)	-18 (low negative)
Mitigation measures	▪ Allow queuing vehicles to pass at regular intervals as needed. ▪ Adequate traffic accommodation signage must be erected and maintained on either side of the access on road R357 throughout the construction period as well as on the National Road N10.	

Table 83: Summary of potential cumulative impacts on communities during construction

IMPACT TABLE FORMAT	
Environmental Parameter	Communities
Issue/Impact/Environmental Effect/Nature	Impact on the community due to the change in the total daily construction traffic.
Extent	Will affect the local area or district.
Probability	Impact will certainly occur.
Reversibility	The impact is partly reversible but more intense mitigation measures are required.
Irreplaceable loss of resources	The impact will not result in the loss of any resources.
Duration	Short term. For the duration of the construction phase.
Cumulative effect	The impact would result in significant cumulative effects.
Intensity/magnitude	Medium
Significance Rating	Low positive impact.

IMPACT TABLE FORMAT		
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	2	2
Probability	4	4
Reversibility	2	2
Irreplaceable loss	1	1
Duration	1	1
Cumulative effect	4	4
Intensity/magnitude	2	2
Significance rating	28 (low positive)	28 (low positive)
Mitigation measures	▪ None	

6.3 Identification of Mitigation Measures

6.3.1 Biodiversity

- Restrict impact to development footprint only and limit disturbance creep into surrounding areas.
- As far as possible, locate infrastructure within areas that have been previously disturbed or in areas with lower sensitivity scores.
- Undertake detailed field surveys of the proposed footprint of infrastructure to locate any sensitive ecological features. If necessary, shift infrastructure to avoid impacts on specific features or relevant permits need to be obtained.
- Compile a Rehabilitation Plan.
- Compile an Alien Plant Management Plan, including monitoring, to ensure minimal impacts on surrounding areas.
- It is a legal requirement to obtain permits for specimens that will be lost. A pre-construction walk-through survey will be required during a favourable season to locate any affected plants. Plants lost to the development can be rescued, where feasible, and planted in appropriate places during rehabilitation. This will reduce the irreplaceable loss of resources as well as the cumulative effect and overall intensity.
- Select alternative sites for infrastructure where features of concern may be affected.
- Prevent erosion impacts on wetland systems.
- Rehabilitate disturbance as quickly as possible.
- Undertake monitoring to evaluate whether further measures would be required to manage impacts.
- Undertake field surveys to determine whether Littledale's Whistling Rat or the Giant Bullfrog, or other species of conservation concern, do or could occur on site or not. If either species occurs on site, the habitat requirements of the species on site needs to be determined. Infrastructure must then avoid sensitive areas or else measures must be put in place to minimise impacts.
- Undertake surveys to determine which species occur on site and whether there are any major concentrations of alien species.

6.3.2 Avifauna

- Restrict the construction activities to the construction footprint area.
- Do not allow any access to areas outside of the construction footprint area during the construction period.
- Measures to control noise and dust should be applied according to current best practice in the industry.
- Maximum used should be made of existing access roads and the construction of new roads should be kept to a minimum.
- Implement a 3km no development buffer zone around the Verreaux's eagle nest at 29°52'56.53"S 22°33'19.06"E.
- Implement a 200m no development buffer zone around the Southern pale Chanting Goshawk nest at 29°56'34.42"S 22°32'55.35"E.
- Implement appropriate buffer zones around all priority species nest which are recorded in the course of the pre-construction monitoring.
- The recommendations of the specialist ecological study must be strictly adhered to.
- Maximum used should be made of existing access roads and the construction of new roads should be kept to a minimum.
- Operational activities should be restricted to the plant area. Maintenance staff should not be allowed to access other parts of the property unless it is necessary for wind farm related work.
- Post-construction monitoring should be implemented to make comparisons with baseline conditions possible.
- If densities of key priority species are proven to be significantly reduced due to the operation of the wind farm, the management of the wind farm must be engaged to devise ways of reducing the impact on these species.
- Once the turbines have been constructed, post-construction monitoring should be implemented to compare actual collision rates with predicted collision rates.
- If actual collision rates indicate high mortality levels, curtailment of selective turbines should be implemented.
- A 200m no-development zone is recommended around all water points.

6.3.3 Bats

- Use permanent lighting only where absolutely necessary for safety/security reasons. Other lights should be used with passive motion sensors and/or only switched on when needed. Utilise wavelengths/colour temperatures that attract less insects.
- Adhere to bat sensitivity maps.
- Apply operational mitigation such as curtailment, deterrents, and any other proven effective measures should the preconstruction bat monitoring confirm that there are periods of high bat activity on the site.
- Apply operational mitigation such as curtailment, deterrents, and any other proven effective measures during migration periods determined by the bat assessment or by data thereafter.

6.3.4 Surface Water

- Location of the Lay-down Area – The location of the lay-down area must not be within 50m of any of the identified surface water resources. Additionally, materials and machinery must be kept away from surface water resources as far as practically possible.
- Preventing Fire Risks – Operational fire extinguishers are to be available in the case of a fire emergency. Given the dry seasons that the study site experiences, it is recommended that a fire management and emergency plan compiled by a suitably qualified health and safety officer be compiled and implemented for the proposed development.
- Preventing Physical Degradation of Surface Water Resources – Surface water resources are to be designated as "highly sensitive areas". Vehicle access must avoid, where possible, these sensitive areas. Should internal access roads be routed in a surface water resources a water use license will be required before construction takes place and all mitigation measures are to be implemented accordingly.
- Limiting Damage to Surface Water Resources – Ideally, to minimise any impact to surface water resources, the proposed development (including buildings, wind turbines and all associated infrastructure) should seek to avoid all surface water resources as far as possible. Where this is not possible a single access route or "Right of Way" (RoW) is to be established through or in the desired construction area in the surface water resource(s). The establishment of the RoW likewise must be demarcated and made visible. The width of the RoW must be limited to the width of the vehicles required to enter the surface water resource. An area around the locations of the proposed development buildings, wind turbines and any other associated infrastructure will be required in order for construction vehicles and machinery to operate/manoeuvre, only where required. This too must be limited to the smallest possible area and made visible by means of demarcation.
- Construction workers are only allowed in the designated construction areas of the proposed development and not into the surrounding surface water resources. Highly sensitive areas are to be clearly demarcated prior to the commencement of construction.
- Preventing Soil Contamination –Only authorised vehicles should be allowed into the highly sensitive areas. Vehicles that have oil, fuel or any other fluid leaks, are not to be allowed into surface water resources.
- All vehicles and machinery must be regularly serviced and maintained, and routinely checked for leakages. No fuelling, re-fuelling, vehicle and machinery servicing or maintenance is to take place in the highly sensitive areas.
- The study site is to contain sufficient spill contingency measures throughout the construction process. These include, but are not limited to, oil spill kits to be available, fire extinguishers, fuel, oil or hazardous substances storage areas must be bunded to prevent oil or fuel contamination of the ground and/or nearby surface water resources.
- Minimising Human Physical Degradation of Sensitive Areas – Construction workers are only allowed in designated construction and RoW areas. The highly sensitive areas are to be clearly demarcated no access into these areas are to be allowed unless authorised.
- No animals on the construction site or surrounding areas are to be hunted, captured, trapped, removed, injured, killed or eaten. Should any party be found guilty of such an offence, stringent penalties should be imposed. The appointed Environmental Control Officer is to be contacted should removal of any fauna be required during the construction phase.

- No “long drop” toilets are allowed on the study site. Suitable temporary chemical sanitation facilities are to be provided. Temporary chemical sanitation facilities must be placed at least 100 meters from any surface water resource(s) where required. Temporary chemical sanitation facilities must be placed over a bunded or a sealed surface area and adequately maintained to prevent pollution impacts.
- No water is to be extracted unless a water use license is granted for specific quantities for a specific water resource.
- No hazardous or building materials are to be stored or brought into the highly sensitive areas. Should a designated storage area be required, the storage area must be placed at the furthest location from the highly sensitive areas. Appropriate safety measures as stipulated above must be implemented.
- No cement mixing is to take place in a surface water resource.
- Strategic Positioning of Wind Turbines, Buildings and other Infrastructure – Preferably all wind turbines, buildings and infrastructure should be placed at least 50m from any surface water resource as far as practically possible. This will significantly reduce the potential impact on surface water resources. Where this is not possible, more intense mitigation measures will be required as stipulated below.
- Obtaining Relevant Authorisations and Licenses – Before any construction or removal of soils and vegetation in any delineated surface water resources is undertaken, the relevant water use license is to be obtained and conditions adhered to.
- Limiting Damage to Surface Water Resources – Construction must be limited to the authorized RoW areas where applicable.
- Limiting Removal of Excavated Soils – Excavated topsoils should be stockpiled separately from subsoils so that it can be replaced in the correct order for rehabilitation purposes post-construction. Soils removed from surface water resources must only be removed if absolutely required. The topsoil is to be used for rehabilitation purposes and should not be removed unless there is surplus that cannot be utilised. It is important that when the soils are re-instated, the subsoils are to be backfilled first followed by the topsoil. The topsoil contains the natural seedbank from which the affected surface water resources or the associated buffer zone can naturally rehabilitate.
- Where the soils are excavated from the sensitive areas, it is preferable for them to be stockpiled adjacent to the excavation pit to limit vehicle and any other movement activities around the excavation areas.
- Preventing Pollution Impacts – Any cement mixing in a surface water resource should take place over a bin lined (impermeable) surface or alternatively in the load bin of a vehicle to prevent the mixing of cement with the ground of the surface water resource. Importantly, no mixing of cement directly on the surface is allowed in the construction and RoW areas in surface water resources.
- Protection of Stockpiled Soils – Stockpiled soils, removed from a surface water resource, will need to be protected from wind and water erosion. Stockpiled soils, removed from a surface water resource, are not to exceed a 3m height and are to be bunded by suitable materials. Stacked bricks surrounding the stockpiled soils can be adopted. Alternatively, wooden planks pegged around the stockpiled soils can be used.
- Rehabilitation of RoW Areas – Ideally, the affected RoW zones in the sensitive areas must be re-instated with the soils removed from the surface water resource(s), and the affected areas must be levelled, or appropriately sloped and scarified to loosen the soil and allow seeds contained in the natural seed bank to re-establish. However, given the aridity of the study area, it is likely that

vegetation recovery will be slow. Rehabilitation areas will need to be monitored for erosion until vegetation can re-establish where prevalent. If affected areas are dry and no vegetation is present, the soil is to be re-instated and sloped.

- Preventing Increased Run-off and Sedimentation Impacts – Vegetation clearing should take place in a phased manner, only clearing areas that will be constructed on immediately. Vegetation clearing must not take place in areas where construction will only take place in the distant future.
- An appropriate storm water management plan formulated by a suitably qualified professional must accompany the proposed development to deal with increased run-off in the designated construction areas.
- In general, adequate structures must be put into place (temporary or permanent where necessary in extreme cases) to deal with increased/accelerated run-off and sediment volumes. The use of silt fencing and potentially sandbags or hessian “sausage” nets can be used to prevent erosion in susceptible construction areas. Grass blocks on the perimeter of the wind turbine hard stand areas and building structure footprints can also be used to reduce run-off and onset of erosion. Where required more permanent structures such as attenuation ponds and gabions can be constructed if needs be, however this is unlikely given the study area. All impacted areas are to be adequately sloped to prevent the onset of erosion.
- Minimising Vehicle Damage to the Surface Water Resources – Potential impacts can be avoided by the planning and routing of access / service roads outside of and away from surface water resources.
- Where access through surface water resources are unavoidable and are absolutely required, it is recommended that any road plan and associated structures (such as stormwater flow pipes, culverts, culvert bridges etc.) be submitted to the relevant environmental and water departments for approval prior to construction.
- Access and services roads authorised in sensitive areas will have to be regularly monitored and checked for erosion. Monitoring should be conducted once every two months. Moreover, after short or long periods of heavy rainfall or after long periods of sustained rainfall the roads will need to be checked for erosion. Rehabilitation measures will need to be employed should erosion be identified.
- Where erosion begins to take place, this must be dealt with immediately to prevent significant erosion damage to the surface water resources. Should large scale erosion occur, a rehabilitation plan will be required. Input, reporting and recommendations from a suitably qualified engineer/wetland/surface water specialist must be obtained in this respect should this be required.
- Any hardstand area or building within 50m proximity to a surface water resource must have energy dissipating structures in an appropriate location to prevent increased run-off entering adjacent areas or surface water resources. This can be in the form of hard concrete structures or soft engineering structures (such as grass blocks for example).
- Alternatively, a suitable operational storm water management design or plan can be compiled and implemented that accounts for the use of appropriate alternative structures or devices that will prevent increased run-off and sediment entering adjacent areas or surface water resources.

6.3.5 Soils and Agricultural Potential

- These would include: ensuring that the minimum area possible is set aside for the project infrastructure, so that the natural vegetation is undisturbed and grazing of livestock can continue on site post-construction.
- Protection of the vegetation covering is vital, so that as little vegetation as possible to be removed. If bare topsoil results, it should be covered by a soil protection layer, such as a geotextile, to stabilize the site until vegetation can re-establish.

6.3.6 Noise

- Construct access roads to avoid vehicle movements near residential area.
- Restrict the construction activities to working hours as stipulated in the EMPr.
- Take appropriate measures to ensure acceptable noise levels at residences and compliance with the Noise Control Regulations as required by the noise specialist. This will require detailed calculations during EIA phase based on noise emission data of the turbines to be provided by the client.
- The only practical means of mitigating the noise impact at noise sensitive receptors would be to increase the separation distance between wind energy turbines and the receptors. The minimum separation distances would need to be determined by sound propagation calculations in accordance with SANS 10357:2004. The calculation of sound propagation by the Concawe method based on detailed sound power emission spectrum levels of the specific wind energy turbines being considered by the client and 3-dimensional topographical data of the study area.

6.3.7 Visual

- Minimise vegetation clearing and rehabilitate cleared areas as soon as possible.
- Maintain a neat construction site by removing rubble and waste materials regularly.
- Make use of existing gravel access roads where possible.
- Ensure that dust suppression techniques are implemented on all access roads, if deemed necessary.
- All reinstated cable trenches should be re-vegetated with the same vegetation that existed prior to the cable being laid.
- Light fittings for security at night should reflect the light toward the ground and prevent light spill.
- Except for lighting that is necessary for security, the operations and maintenance buildings should not be illuminated at night.
- If overhead power lines are required, align power lines to run parallel to existing power lines and other linear impacts, where possible.
- Bury cables under the ground where possible.
- The operation and maintenance building should be painted with natural tones that fit with the surrounding environment. Non-reflective surfaces should be utilised where possible.
- Select the alternatives that will have the least impact on visual receptors.

6.3.8 Heritage

- Monitoring during construction by an archaeologist
- Mitigation through archaeological excavations and collection
- Walk down of final power line route.

6.3.9 Socio-Economic

- In order to optimise the stimulation of the local economy through direct, indirect, and induced effects, the following should be applied where possible:
    - Procure construction materials, goods, and products from local suppliers if feasible.
    - Employ local contractors where possible.
- Recruit local labour as far as feasible to increase the benefits to the local households.
- Sub-contract to local construction companies if feasible.
- Use local suppliers where viable and arrange with the local Small and Medium Enterprises to provide transport, catering, and other services for the construction crew.
- Employ labour-intensive measures in construction if possible.
- Employ local residents if possible.
- Sub-contract to local construction companies if possible.
- Use local suppliers where viable and arrange with the local Small and Medium Enterprises to provide transport, catering, and other services for the construction crew. Set-up a skills desk at the local municipal office and in the nearby communities to identify skills available in the community and assist in recruiting local labour during both construction and operation.
- Contractors should provide learnerships and on-job training;
- Where specialist training can be provided, candidates from local communities should be prioritised for training; and
- Share knowledge with the sub-contracting companies during the construction period.
- Reasonable compensation must be negotiated with the affected farmers.
- Should resettlement of farm workers be required, a Resettlement Action Plan must be developed and implemented.
- Implementation of rehabilitation measures.
- The developers could implement the following measures to limit the occurrence of an increase in social pathologies:
    - Employ locals as far as feasible through the creation of the local skills database and recruitment of suitable candidates.
    - Set up a gate or access control to site to limit or completely eliminate the possibility of livestock theft and burglaries at the residential properties.
    - Control the movement of workers between the site and areas of residence to minimise loitering.
    - The contractors should make the necessary arrangements for allowing workers from outside the area to return home over weekends and/ or on a regular basis. This would reduce the risk posed to local family structures and social networks.
    - Implementing health awareness campaigns to curb the potential of spreading disease, use of drugs, or alcohol abuse for example.

- Engage with local authorities and inform them of the development as well discuss with them the ability of the municipality to meet the demands for social and basic services created by the migrant construction workers.
- Where feasible, assist the municipality in ensuring that the quality of the local social and economic infrastructure does not deteriorate further (especially the local roads).
- The project should aim to benefit the local economy as far as possible and feasible by opting for procurement of local goods and services.
- Where possible, the employment of local labour should be practiced to increase the benefit to the local community through prevention of leakage of buying power.
- Local small businesses should also be approached to investigate the possibility of supplying inputs for maintenance and operations where viable, this should increase local indirect employment creation.
- In order to improve the chances of skills being developed during the operational period it is recommended that vocational skills transfer/training programmes be developed and knowledge sharing among employees encouraged. This mitigation measure could potentially improve the weighting of the impact in terms of its probability and increase it significance slightly.
- It is recommended that the project owner develops practical SED and ED programmes throughout the project's lifespan. The plan should be developed in consultation with local authorities and existing strategy documents to identify community projects that would result in the greatest social benefits. With regard to ED initiatives, focus should be on developing plans to support and create sustainable, self-sufficient enterprises. It is important that these plans be reviewed annually and where possible updated.

6.3.1 Traffic

- Permits must be obtained in order to transport the turbine components.
- Obtain consent from SANRAL Western Region for the abnormal load transport on their roadways.
- Adequate traffic accommodation signage must be erected and maintained on either side of the access on road R357 throughout the construction period.
- Allow queuing vehicles to pass at regular intervals as needed.

6.3.2 Radiation Emissions

- In order to negate the risk to an acceptable level, all equipment to be installed on site must comply with levels of 10 to 20dB below the EN 55022 Class B limit as the primary mitigation measure. Where equipment exceeds this threshold, additional shielding and filtering should be implemented to reduce the electromagnetic emissions from the windfarm. Shielding and filtering solutions are available to ensure installed plant equipment emissions remain within SKA risk tolerances. The results of the assessment do however show that required levels of 10 to 20 dB below the CISPR 22 Class B limit should be achievable.
- Shielding of base to nacelle cables should be implemented by means of enclosed conduit, flexible conduit and termination on the gland plate.
- Where feasible, emissions from cables should be absorbed with ferrite material rather than installing filters, especially in the nacelle.

- Mitigation should include shielded cabinets, shielded cable trays and the use of absorptive cable sleeves.
- To verify overall windfarm emissions, ambient measurements should be done at the new site before construction starts. Tests points should be carefully selected based on test equipment sensitivity with the objective to observe the increase in ambient emissions as construction progresses.

6.4 Assessment of Cumulative Impacts

The area has seen a notable interest from developers of various renewable energy projects, which could be associated with the energy resource potential found in the region, proximity to the existing sub-station and its evacuation capacity, as well as other factors. Such developments, whether already approved or only proposed, need to be considered as they have the potential to create numerous cumulative impacts, whether positive or negative, if implemented.

The table below lists the projects that will need to be considered when examining the cumulative impacts; their location relative to the project under review is illustrated in **Figure 42**.

Table 84: Proposed renewable energy projects in the area

Proposed Development	DEA Reference Number	Current Status of EIA	Proponent	Capacity	Farm Details
The Badudex Solar Project	14/12/16/3/3/2/546	EIA underway	Budadex (Pty) Ltd	74 MW	Portion 1 of the Farm Volgelstruis Bult No 104
The Moiblox Solar Project	14/12/16/3/3/2/547	EIA underway	Moiblox (Pty) Ltd	75 MW	Remainder of the Farm Bosjesmansberg
Garob Wind Energy Facility Project	14/12/16/3/3/2/279	Awarded Preferred Bidder Status.	Garob Wind Farm (Pty) Ltd	140 MW	Portion 5 of the Farm Nelspoortje No. 103
Copperton Wind Energy Facility	12/12/20/2099	Awarded Preferred Bidder Status.	Plan 8 Infinite Energy (Pty) Ltd	140 MW	Portion 4 of the Farm Nelspoortje No. 103; and Portion 7 of the Farm Nelspoortje No. 103.
Humansrus Solar PV Energy Facility 1 and 2	14/12/16/3/3/2/707 14/12/16/3/3/2/708	Authorised	Humansrus Solar PV Energy Facility 1 (Pty) Ltd	75 MW	Remainder the Farm Humansrus No. 147
Humansrus Solar PV Energy Facility 3 and 4	14/12/16/3/3/2/888 14/12/16/3/3/2/887	EIA underway	Humansrus Solar PV Energy Facility 3/4 (Pty) Ltd	75 MW	Remainder the Farm Humansrus No. 147
Mierdam Solar Photovoltaic Facility	12/12/20/2320/2	Authorised	South Africa Mainstream Renewable Power Mierdam (Pty) Ltd	75 MW	Portion 1 of the Farm Kaffirs Kolk No. 118
Platsjambok East and West Solar Photovoltaic Facility	12/12/20/2320/4 12/12/20/2320/5	Authorised	South Africa Mainstream Renewable Power Mierdam (Pty) Ltd	75 MW	Remainder of the Farm Platsjambok 102
Helena Solar 1, 2, and 3 PV energy facility	14/12/16/3/3/2/765 14/12/16/3/3/2/766 14/12/16/3/3/2/767	EIA underway	BioTherm Energy (Pty) Ltd	75 MW	Portion 3 of the Farm Klipgats Pan No. 117

Renewable Energy Farm near Prieska	14/12/16/3/3/2/608 14/12/16/3/3/2/609	EIA underway	NK Energie (Pty) Ltd	UNKNOWN	Portion 3 of the Farm Hedley Plains No. 64 and Portion 5 of the Farm Doonies Pan No. 106
Photovoltaic Power Generation Facility near Prieska	12/12/20/1722	Awarded Preferred Bidder Status in REIPPP Window 1.	Mulilo Renewable Energy Solar PV Prieska (RF) (Pty) Ltd	19.9 MW	Portion 1 of the Farm Volgelstruis Bult No 104
PV Energy Plant near Copperton	12/12/20/2502	Authorised	Mulilo Renewable Energy (Pty) Ltd	100 MW	Portion 1 of the Farm Volgelstruis Bult No 104
Mulilo Sonnedix Prieska PV	12/12/20/2503	Awarded Preferred Bidder Status in REIPPP Window 3. Currently being constructed.	Mulilo Sonnedix Solar Enterprises (Pty) Ltd	75 MW	Remainder of the Farm Hoekplaas No. 146
Mulilo Prieska PV	12/12/20/2501	Awarded Preferred Bidder Status in REIPPP Window 3. Currently being constructed.	Mulilo Prieska PV (Pty) Ltd	75 MW	Portion 4 of the Farm Klipgats Pan No. 117
PV 2, PV 3, PV 4, PV 5 and PV 7 Energy Plants on the Farm Klipgats Pan	14/12/16/3/3/2/486 14/12/16/3/3/2/487 14/12/16/3/3/2/488 14/12/16/3/3/2/489 14/12/16/3/3/2/491	EIA underway	Mulilo Renewable Energy (Pty) Ltd	75 MW	Portion 4 of the Farm Klipgats Pan No. 117
PV 2, PV 3, PV 4, PV 6, PV 7, PV 11 and PV 12 Solar Energy Plants on the Farm Hoekplaas	14/12/16/3/3/2/493 14/12/16/3/3/2/494 14/12/16/3/3/2/495 12/12/16/3/3/2/497 14/12/16/3/3/2/498 14/12/16/3/3/2/502 14/12/16/3/3/2/503	EIA underway	Mulilo Renewable Energy (Pty) Ltd	75 MW	Remainder of the Farm Hoekplaas No. 146
Proposed Aletta Wind Energy Facility	14/12/16/3/3/2/945	EIA underway	BioTherm Energy (Pty) Ltd	140MW	Portion 1, 2, 3 and the Remainder of Drielings Pan No.101

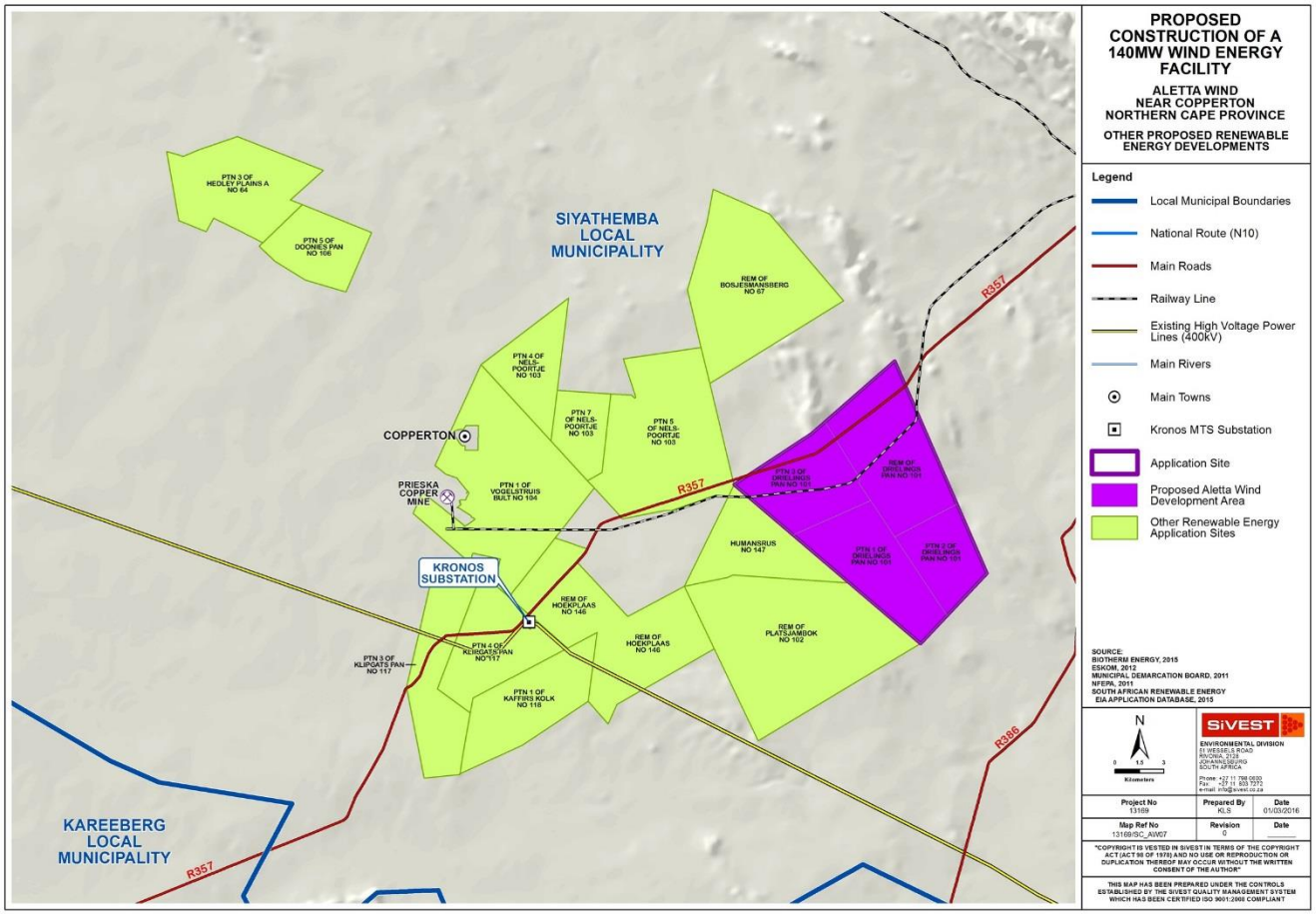


Figure 42: Location of other renewable energy projects (proposed and approved) in the area

In order to identify potential fatal flaws, each specialist has identified and rated the potential cumulative impact of the proposed development during the scoping phase impact assessment. A summary of the potential cumulative impacts identified by each specialist is provided in Table 85 below. The EIA phase specialist studies will further identify site specific cumulative impacts and a detailed assessment of cumulative impacts, including a review of other specialist studies conducted for renewable energy projects in the area, will be included in the DEIAr. The recommendations contained in the specialist reports will be reflected in the mitigation measures provided in the DEIAr and EMPr.

Table 85: Summary of potential cumulative impacts resulting from the proposed development

Environmental Parameter	Potential Cumulative Impacts
Biodiversity	▪ Added to existing impacts on natural habitat from mining activities in the general region, the current project will cause additional loss of indigenous natural vegetation, but the cumulative effect will not be great. ▪ Added to existing impacts on natural habitat, the current project will cause additional loss of habitat in watercourses and drainage areas.
Avifauna	▪ The priority species that occur (or are likely to occur) at the proposed site all have large distribution ranges, the cumulative impact of displacement would therefore be locally significant, rather than regionally or nationally significant. ▪ There are several renewable energy developments planned around Copperton which will result in a significant area of transformed habitat at a local scale, and therefore potentially a significant displacement of priority species. ▪ The cumulative impact will depend largely on which species are killed. If Verreaux's Eagles are killed, the regional impact will be significant. Bustards suffer high mortality on power lines, for these species the cumulative impacts may be medium.
Bats	▪ The cumulative impact of foraging bat mortalities occurring with operating turbines due to direct blade impact or barotrauma is expected to be high. This is expected to be high because it is expected that the elevated bat activity occurring during certain summer months, is due to bats spreading from the Orange River to surrounding areas including the study site. Thus bats killed on site may affect agricultural activities in the Prieska area. ▪ The cumulative impact of migrating bat mortalities occurring with operating turbines due to direct blade impact or barotrauma is expected to be high. Since migrating bats being killed will affect other regions apart from the site, even in other provinces. Migrating insect eating bats are also cave dwelling, therefore cave ecosystems dependant on their guano will be adversely affected if large numbers of the migrating colony is killed. ▪ Artificial lighting close to turbines or at the turbine base will attract insects and therefore attract insect eating bats. This will significantly increase the likelihood of bats being killed by operating turbines. Additionally, it can ecologically favour bat species that readily forage around lights above species that avoid lights, thereby altering local population structures and

	diversity. The cumulative impact could be high if other wind energy facilities in the larger area also have artificial lighting.
Surface water	Cumulative impacts associated with the proposed project are mostly expected to be low, however the some impacts are likely to have a medium cumulative impact. These are: ▪ Vehicle and machinery degradation to surface water resources ▪ Degradation and removal of soils and vegetation associated with surface water resources ▪ Increased storm water run-off, erosion and increased sedimentation impacting on surface water resources ▪ Impermeable and hardened surfaces creating accelerated run-off, consequent erosion and sedimentation
Soils and Agricultural Potential	▪ The cumulative impact of the increased potential for erosion of topsoil by wind is expected to be medium as wind-blown sediments can travel long distances
Noise	▪ Cumulative impacts identified are expected to be low.
Visual	▪ Cumulative visual impacts associated with the construction and operational phases are expected to be medium. As such, an assessment of the cumulative impact that will be experience from each potentially sensitive receptor will be undertaken in the next phase of this study, once the sensitive receptor locations have been confirmed.
Heritage	▪ A large number of renewable energy projects are proposed and some have been approved and is currently in construction around the study area. Although some studies in the wider study area have proposed mitigation work only one report on mitigation work (Orton, 2014) for the Mulilo Prieska PV (Pty) Ltd development just south of the Copperton, has been completed at this stage. ▪ The need for the implementation of the recommended mitigation measures is of great importance and must be seen in the context of the large areas to be impacted by the construction activity. By implementing the mitigation measures the cumulative effect will be reduce from a Medium to a Low negative impact rating.
Socio-economic	The cumulative impact of several positive impacts could be high considering other renewable energy projects planned for the Pixley ka Seme DM and also in the province in general. These include: ▪ Increase in production and GDP-R of the national and local economies due to project capital expenditure and through operation and maintenance activities ▪ Temporary and long-term employment in the local communities and elsewhere in the country ▪ Skills development due to the creation of new employment opportunities ▪ Improved standard of living of households directly or indirectly benefiting from created employment opportunities ▪ Increase in government revenue due to investment

	▪ Investment in the local communities and economic development projects as part of a Social Economic Development and Enterprise Development plan The cumulative impact of several negative impacts could also be high, including: ▪ Potential decrease of efficacy of agricultural land ▪ Change in demographics of the area due to influx of workers and job seekers ▪ Increase in social pathologies associated with influx of migrant labourers and job seekers to the area (health, crime, prostitution, xenophobia, etc.) ▪ Added pressure on basic services and social and economic infrastructure ▪ Altered sense of place
Traffic	In the event that all the facilities are in construction at the same time, the cumulative effect of the abnormal load vehicles on the daily traffic volume would elevate the delay experienced by the road user. This is assuming the exact same route will be used by all the individual developments. The normal heavy and light vehicles will not affect the level of service of any of the sections of road proposed for use.

7 LAYOUT ALTERNATIVES

One of the aims of the Scoping report is to identify alternatives to carry through to the EIA phase of the investigation for detailed assessment (as was discussed in Chapter 2). The selection of alternatives during the scoping phase of the project usually helps to focus future investigations, both in terms of the environmental investigations required and the scope of the public participation process. As discussed in section 2.3.3, BioTherm initially considered a 125 turbine layout, which was revised to an 80 turbine layout prior to the start of the EIA and specialist studies. This was done primarily as a result of SKA considerations.

Various specialists identified preliminary site specific sensitive areas during the scoping phase of the EIA that may need to be precluded from the buildable area. These include the avifaunal, bats, biodiversity, heritage and surface water specialists. The sensitive areas identified by these specialists were used to guide the design of wind farm where practical. The identified sensitive areas were also used to assess the impacts of each of the proposed alternatives on the environment. The sensitive areas as identified by various specialists via desktop means are shown in **Figure 43** below.

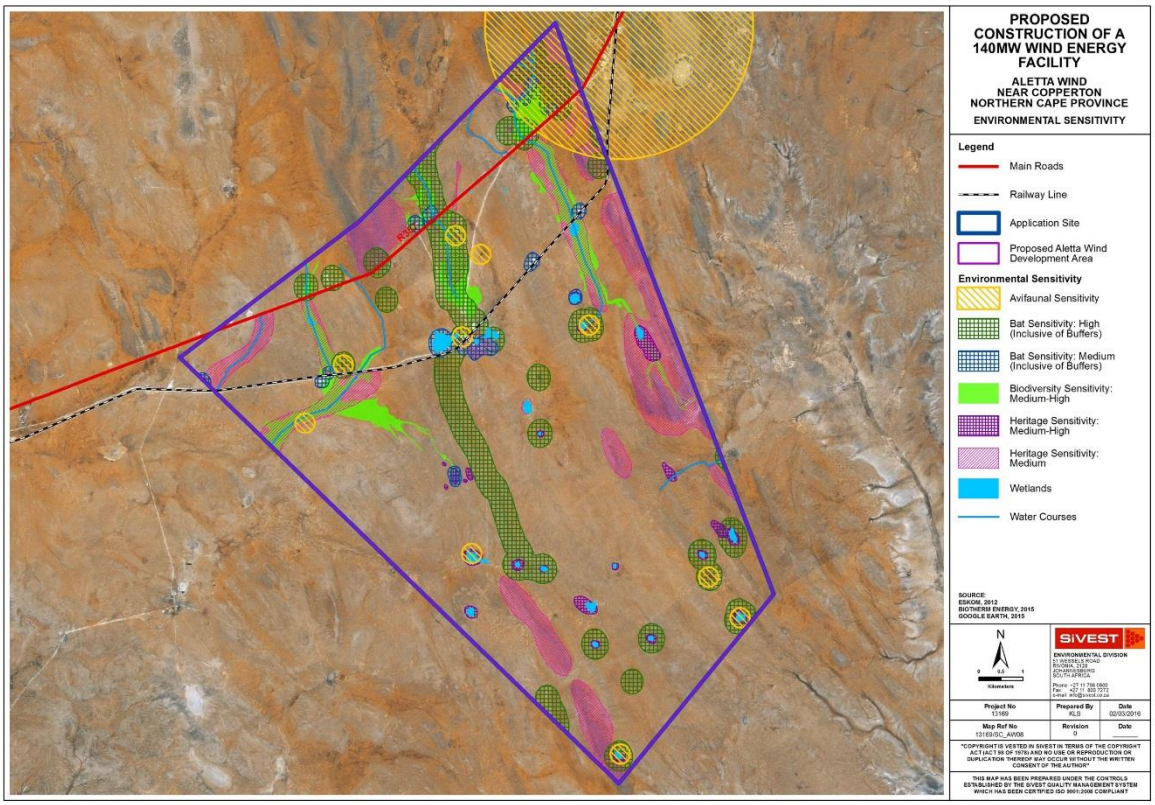


Figure 43: Sensitive areas as pertaining to avifauna, bats, biodiversity, heritage and surface water

As a result of additional information pertaining to the SKA, a 60 turbine layout was introduced as an alternative to the proposed 80 turbine layout, the 60 turbine layout includes a 25km buffer around the nearest SKA station. The additional information included the results of the Electromagnetic Interference

assessment, the location of a planned SKA site to the south-west of the proposed project and an increased understanding of wind turbine technology. The reduction in turbines places greater technical restriction on BioTherm, however, they are committed to work with the SKA and aim to mitigate any potential impacts as far as technically feasible .In addition to the alternative 60 turbine and 80 turbine layout alternatives, alternative layouts for the onsite 132kV substation and O&M buildings have also been assessed. For the associated infrastructure, the 60 turbine layout includes two alternative layouts, and the 80 turbine layout includes three alternative layouts. The layout alternatives were selected based on a preliminary identification of sensitive areas. In order to provide a preliminary assessment of alternatives, the proposed layout alternatives were overlaid onto the sensitive areas identified by specialists. The combined maps are shown below in **Figure 44** and **Figure 45** and a summary of the assessment is provided in Table 86 below.

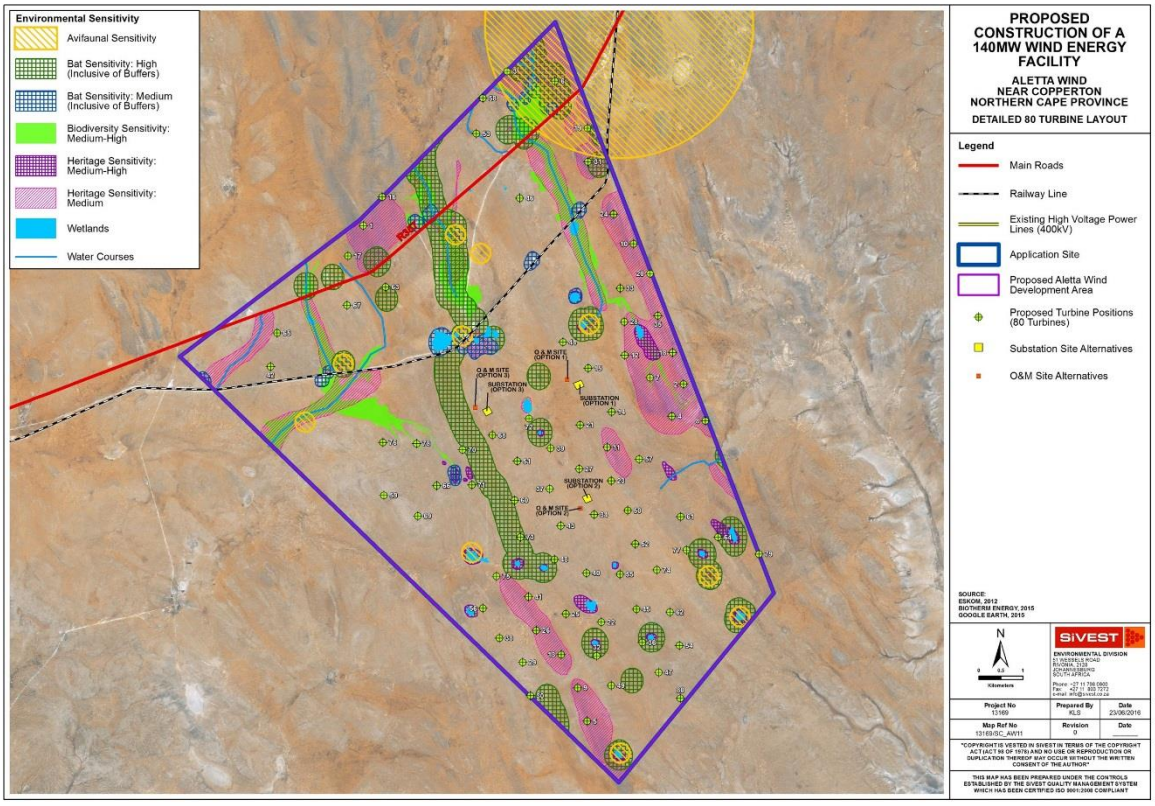


Figure 44: Proposed Aletta 80 Turbine Layout Alternatives and Environmental Sensitivity

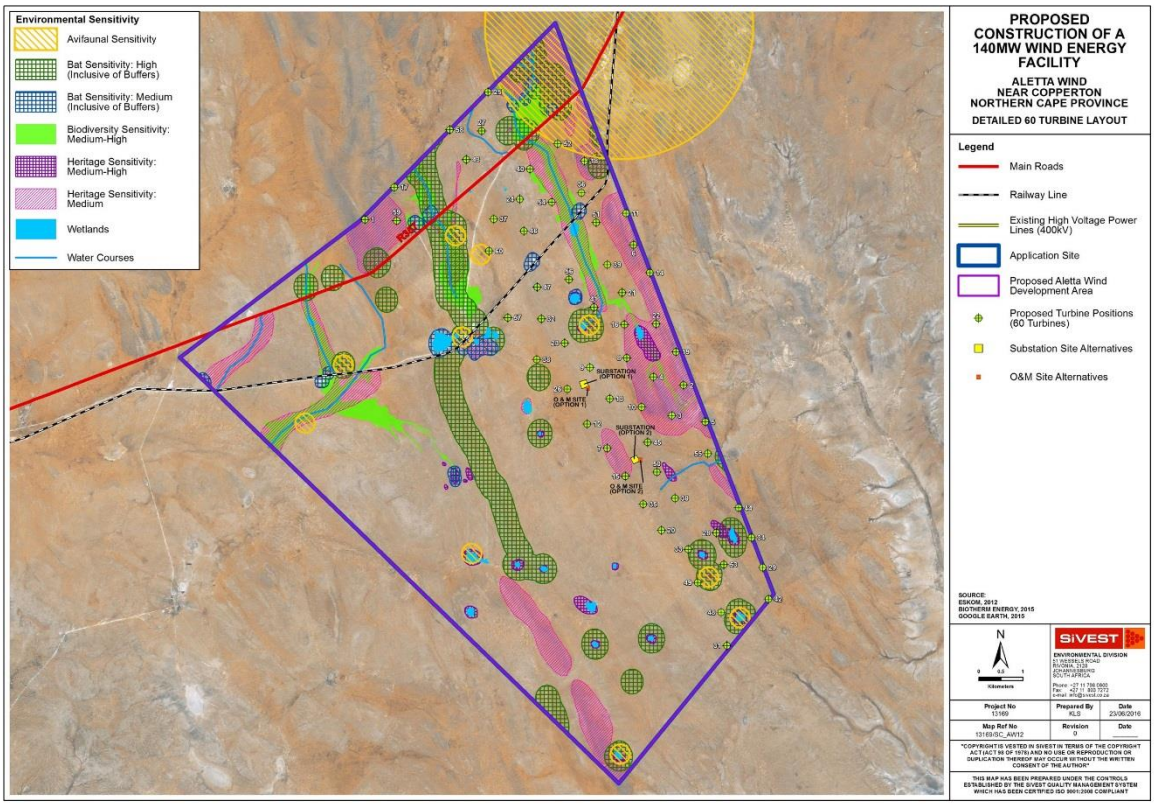


Figure 45: Proposed Aletta 60 Turbine Layout Alternatives and Environmental Sensitivity

Key

PREFERRED	The alternative will result in a low impact / reduce the impact
FAVOURABLE	The impact will be relatively insignificant
NOT PREFERRED	The alternative will result in a high impact / increase the impact
NO PREFERENCE	The alternative will result in equal impacts

Table 86: Aletta Alternatives Assessment summarising the impacts, highlighting issues/concerns and indicating the preference associated with each alternative

ALTERNATIVE	PREFERENCE	CONCERNS / IMPACT SUMMARY
80 TURBINE LAYOUT		
80 Turbine Layout	**NOT PREFERRED**	The 80 turbine layout affects a large number of sensitive areas which were identified by the specialists. These include areas of avifaunal, bat, biodiversity, heritage and surface water sensitivity. Although many of the turbines are not located in sensitive areas, it is likely that these could be affected by construction activities in close proximity. The total footprint of the 80 turbine

		layout would be significantly bigger than that of the 60 turbine layout, and the impacts are likely to be larger as a result. According to the SKA, the closest SKA site to Aletta is located to the south-west of the project (21km), the turbines to the south-west of the development area are therefore relatively close to the SKA site. For these three reasons the 80 turbine layout has been found to be not preferred compared to the 60 turbine layout.
80T SUBSTATION AND O&M BUILDING		
80T Substation and O&M Buildings Option 1	**NO PREFERENCE**	None of the three proposed locations for the substation and O&M building are sited in close proximity to the sensitive areas identified by specialists. There is therefore no preference between the three alternatives.
80T Substation and O&M Buildings Option 2	**NO PREFERENCE**	None of the three proposed locations for the substation and O&M building are sited in close proximity to the sensitive areas identified by specialists. There is therefore no preference between the three alternatives.
80T Substation and O&M Buildings Option 3	**NO PREFERENCE**	None of the three proposed locations for the substation and O&M building are sited in close proximity to the sensitive areas identified by specialists. There is therefore no preference between the three alternatives.
60 TURBINE LAYOUT		
Proposed O&M Buildings Alternative 1	**PREFERRED**	Compared to the 80 turbine layout, the 60 turbine layout affects fewer of the sensitive areas that were identified by specialists. In particular, a large area that was identified as having high bat sensitivity is entirely avoided with the 60 turbine layout. There are also wetlands and areas of medium to high avifaunal, heritage and biodiversity sensitivity, which would be avoided if the 60 turbine layout is selected. The total footprint of the turbines will be significantly smaller if the 60 turbine layout is constructed. Additionally, the 60 turbine layout is aligned with the eastern edge of the property, which if further (25km) from the proposed SKA site. The 60 turbine layout is therefore the environmentally preferred alternative.
60T SUBSTATION AND O&M BUILDING		

60T Substation and O&M Buildings Option 1	**PREFERRED**	Option 1 is located relatively far from any of the sensitive areas identified by the specialists and this alternative has therefore been selected as the preferred alternative.
60T Substation and O&M Buildings Option 2	**FAVOURABLE**	Option 2 is located in relatively close proximity to an area identified as having medium heritage sensitivity, however it is not located within the potentially sensitive area. The option is therefore considered to be favourable for the proposed substation and O&M building, although not preferred.

The 60 turbine layout was clearly selected as the preferred alternative as per the scoping phase specialist findings, and it is recommended that this alternative be further assessed during the EIA phase. Although 60T Substation and O&M Buildings Option 1 was slightly preferred over Option 2, both alternatives were favourable and it is recommended that both alternatives be taken through to the EIA phase. It is recommended that further studies be done on the proposed site alternatives during the EIA phase, including specialist fieldwork.

8 PUBLIC PARTICIPATION PROCESS

Public participation is the cornerstone of any EIA. The principles of NEMA as well as the EIA Regulations govern the EIA process, including public participation. These include provision of sufficient and transparent information on an ongoing basis to stakeholders to allow them to comment, and ensuring the participation of previously disadvantaged people, women and the youth.

The public participation process is primarily based on two factors; firstly, ongoing interaction with the environmental specialists and the technical teams in order to achieve integration of technical assessment and public participation throughout. Secondly, to obtain the bulk of the issues to be addressed early on in the process, with the latter half of the process designed to provide environmental and technical evaluation of these issues. These findings are presented to stakeholders for verification that their issues have been captured and for further comment.

Input into the public participation process by members of the public and stakeholders can be given at various stages of the EIA process. Registration on the project can take place at any time during the EIA process up until the final EIA report is submitted to DEA. There are however set periods in which comments are required from Interested and / or Affected Parties (I&APs) in order to ensure that these are captured in time for the submission of the various reports. The comment periods during the scoping phase were implemented according to NEMA EIA Regulations. The comment periods during the scoping phase (as set out by EIA Regulations 2014) are as follows:

- Comment period for the Draft Scoping Report (DSR): 4 Calendar weeks (30 days).

- Any public participation process must be conducted for a period of at least 30 days.

The EIA regulations emphasise the importance of public participation. In terms of the EIA regulations, registered interested and/or affected parties –

- may participate in the application process;
- may comment on any written communication submitted to the competent authority by the applicant or environmental consultant;
- must comment within the timeframes as stipulated by the EIA Regulations;
- must send a copy of any comments to the applicant or Environmental Assessment Practitioner (EAP) if the comments were submitted directly to the competent authority; and
- must disclose any direct business, financial, personal or other interests that the person has in the application being granted or refused.

Further, in terms of the EIA regulations, the EAP:

- manages the application process;
- must be independent;
- must undertake the work objectively – even if this results in views and findings that are not favourable to the applicant;
- must disclose material information that may influence the decision; and
- must conduct a public participation process.

The following actions were taken upon receiving comments/queries/issues:

- The contact details provided were entered into the project database for use in future notifications.
- Confirmation of receipt of comments.
- Addressed comments in the Comments & Response Report.

8.1 Objectives of Public Participation

An understanding of what the public participation is, and is what it is not, needs to be explored and must be clarified.

- Public Participation is:
    - A communication mechanism to inform I&APs regarding a proposed project.
    - A communication mechanism to record comments and/or concerns raised during the relevant phase of the EIA by I&APs regarding a proposed project.
- What Public Participation is not:
    - A marketing exercise.

- A process to address grievances but rather to record comments raised.
- One-on-one consultation with each I&AP during the EIA process (not relevant to possibly affected landowners identified).

The primary aims of the PPP are:

- To inform interested and affected parties (I&APs) and key stakeholders of the proposed development.
- To initiate meaningful and timeous participation of I&APs.
- To identify issues and concerns of key stakeholders and I&APs with regards to the proposed development
- To promote transparency and an understanding of the proposed project and its potential environmental impacts.
- To provide information used for decision-making.
- To provide a structure for liaison and communication with I&APs and key stakeholders.
- To assist in identifying potential environmental impacts associated with the proposed development.
- To ensure inclusivity (the views, needs, interests and values of I&APs must be considered in the decision-making process).
- To focus on issues relevant to the project and issues considered important by I&APs and key stakeholders.
- To provide responses to I&AP queries.
- To encourage co-regulation, shared responsibility and a sense of ownership.

In addition to the guidance of the PPP in the EIA Regulations, every effort was also made to conform to the requirements of the Promotion of Administrative Justice Act 2000 (Act 3 of 2000).

8.2 Overview of the Public Participation Process to date

The public participation process for the EIA was initiated in March 2016 with the issuing of the BID and initial landowner consultation. The DSR was released for review on 30 June 2016. The stages that typically form part of the public participation process during the scoping phase are reflected in **Figure 46** below.

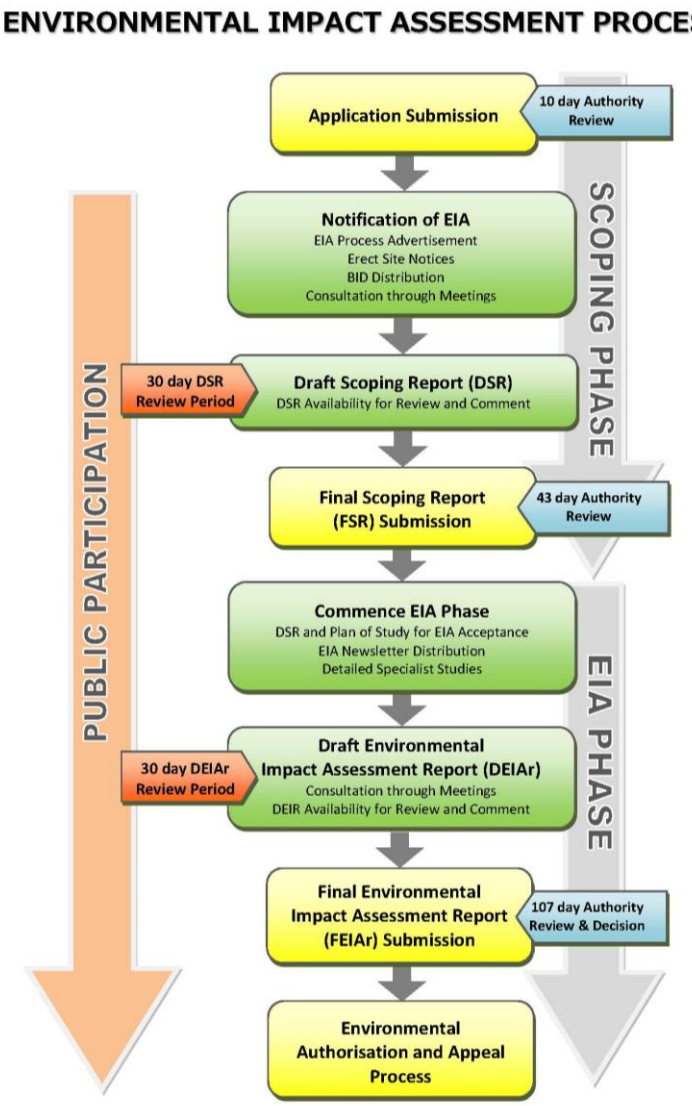


Figure 46: EIA and Public Participation Process

Members of the public who wished to be registered on the database as an I&AP were able to do so via telephone, fax, email, mail or SiVEST's website (www.sivest.co.za).

On-going consultation with key stakeholders (e.g. provincial, district and local authorities, relevant government departments, local business etc.) and identified I&APs ensured that I&APs were kept informed regarding the EIA process. Networking with I&APs will effectively continue throughout the scoping phase of the project until the Final Scoping Report and EIA Plan of Study are submitted to DEA. Where required, stakeholders and I&APs were engaged on an individual basis.

During the environmental studies, consultations were held with individuals, businesses, institutions and organisations, and the following sectors of society have been identified and were afforded the opportunity to comment (the full stakeholder database list is included in Appendix 7F):

- National Authorities;

- Provincial Authorities;
- Siyathemba Local Municipality
- Pixley ka Seme District Municipality
- Government Structures such as SAHRA, SANRAL, Eskom Telkom, etc.;
- Agriculture Associations;
- Regional and local media (advertisements and public documents e.g. BID);
- Business and commerce;
- Environmental bodies / NGOs;
- Department of Environmental Affairs: Biodiversity Section;
- Department of Water and Sanitation;
- Community representatives, CBOs, development bodies;
- Landowners;
- Sentech;
- Square Kilometre Array (SKA);
- Civil Aviation Authority (CAA); and
- Air Traffic and Navigation Services (ATNS).

8.3 Consultation and Public Involvement

Through the consultation process, issues for inclusion within the FSR were identified and confirmed. Telephonic discussions and one-on-one consultation were undertaken where relevant. Informal meetings with landowners took place prior to the release of the DSR in order to identify key issues, needs and priorities for input into the proposed project. Special attention was paid to the consultation with possibly affected landowners and communities within the study area to try and address their main concerns.

8.4 Stakeholders and I&APs

In order to identify possible I&APs, use will be made of:

- print media – EIA process advertisements
    - The Gemsbok newspaper
- site notices throughout the study area (Proofs included in Appendix 7A)
- referrals
- requesting databases and/or contact information from NGOs / CBOs and other organisations

A full database list of registered I&APs was compiled and is included in Appendix 7F.

8.5 Announcing the Opportunity to Participate

The opportunity for stakeholders to participate in the EIA were as follows:

- EIA process advert (29 June 2016).
- I&APs with e-mail addresses and fax numbers were sent copy of the BID.
- BIDs were delivered to various locations within the study area:

The letter of invitation to participate as well as the Registration and Comment Form accompanied the BID.

8.6 Notification of the Potential Interested and Affected Parties

Communication with I&APs were conducted by means of telephone, faxes and email in order to obtain the necessary background information to compile this report. The advertising process was followed in terms of regulation 41 of the EIA Regulations published in R982 in Government Gazette No. 38282 of 4 December 2015, as amended.

An advertisement was placed in the Gemsbok newspaper on 29 June 2016.

In addition, many site notices (as per regulations) were placed near the study area during a site visit on Thursday and Friday the 10th and 11th of March 2016.

As stakeholders respond to these advertisements, they will be registered on the project database and sent letters of invitation to participate as well as the BID.

8.7 Proof of Notification

Appendix 7 includes all proof of notification of Interested and Affected Parties. More specifically, the types of proofs are as follows:

- Site notice text (Appendix 7A)
- Photographs of site notices (Appendix 7A)
- Proof of advertisements in the newspapers (Appendix 7C)
- Background Information Document (Appendix 7B)
- Correspondence to registered I&APs and key stakeholders (Appendix 7D)

8.8 One-on-One Consultation

Where possible, potentially directly affected landowners will be consulted on a one-on-one basis and informed about the proposed project. Any comments and/or concerns received will be noted and included in the Comments and Responses Report.

This consultation process is seen as one of the important aspects of the EIA and Public Participation process. Should the proposed project be granted an Environmental Authorisation, these particular stakeholders will be directly affected and their properties impacted upon. The consultation process will also ensure that as many uncertainties and concerns as possible are raised upfront and channelled to BioTherm to ensure that the stakeholders and the applicant are informed about these issues throughout the process.

8.9 Comments and Response Report

Issues, comments and concerns raised during the public participation process thus far have been captured in the Comments and Response Report (C&RR) which is included in Appendix 7E of the FSR. The C&RR provides a summary of the issues raised, as well as responses provided to I&APs. This information will be used to feed into the evaluation of social impacts. All comments received during the review period of the DSR have been included in the C&RR.

8.10 Comments on Draft Scoping Report

The Draft Scoping Report was made available for public review after submission to DEA, the competent authority.

The report was out for public review and comment for a period of 30 calendar days, from Thursday 30th June 2016 to Monday 01st August 2016. Written notice was given to all registered I&APs as well as all key stakeholders on the database that the DSR was available for public review.

Electronic copies (CD) of the report were also made available and were distributed on written request.

8.11 Organs of State Review of the Draft Scoping Report

In terms of section 40 (2) of the EIA Regulations (as amended), under Government Notices No R982, public participation must include consultation with all organs of state which have jurisdiction in respect of the activity to which the application relates.

Table 87 below includes all the organs of state who were e-mailed the DSR and sent electronic copies (on CD) of the full report including all appendices. Telephonic follow-up with stakeholders was undertaken prior to the end of the comment period in order to provide them with ample opportunity to comment. This is also detailed in the table below.

Table 87: Distribution of the DSR to Organs of State for Comment: Follow-up Consultation

TITLE	SURNAME	NAME	POSITION	POSTAL ADDRESS	EMAIL ADDRESS	DSR DISTRIBUTION	RESPONSE / RECEIPT OF COMMENTS
SIYATHEMBA LOCAL MUNICIPALITY							
Mr	Basson	Jakob	LED Manager	PO Box 16 PRIESKA 8940	jakob@siyathemba.gov.za	Electronic copy on CD posted - 01 July 2016 Electronic copy emailed - 01 July 2016	Access to an electronic copy of the report was emailed on 01 July 2016 and was posted on 01 July 2016. An email reminder was sent on the 26 July 2016. Attempts were made to contact Mr Basson telephonically, however SiVEST was informed that he was unavailable. A message was left for him. Siyathemba LM will have further opportunity to comment in the EIA phase.
Mr	Tshikela	Olwethu	Environmental Health Practitioner	PO Box 16 PRIESKA 8940	tshikelaolwethu@gmail.com	Electronic copy on CD posted - 01 July 2016 Electronic copy emailed - 01 July 2016	Access to an electronic copy of the report was emailed on 01 July 2016 and was posted on 01 July 2016. An email reminder was sent on the 26 July 2016. Attempts were made to contact Mr Tshikela telephonically, however SiVEST was informed that he was unavailable. A message was left for him. Siyathemba LM will have further opportunity to comment in the EIA phase.
PIXLEY KA SEME DISTRICT MUNICIPALITY							
Mr	Nkondeshe	Sonwabile	Senior Environmental Officer	Private Bag X1012 DE AAR 7000	snkondeshe@environment.gov.za	Electronic copy on CD posted - 01 July 2016 Electronic copy emailed - 01 July 2016	Access to an electronic copy of the report was emailed on 01 July 2016 and was posted on 01 July 2016. An email reminder was sent on the 26 July 2016. Attempts were made to contact Mr Nkondeshe telephonically, however SiVEST was informed that he was unavailable. A message was left for him. Prixley Ka Seme DM will have further opportunity to comment in the EIA phase.
Mr	Madyo	Sindisile	LED Manager	Private Bag X1012 DE AAR 7000	excellentsolutions@live.co.za	Electronic copy on CD posted - 01 July 2016 Electronic copy emailed - 01 July 2016	Access to an electronic copy of the report was emailed on 01 July 2016 and was posted on 01 July 2016. An email reminder was sent on the 26 July 2016. Attempts were made to contact Mr Madyo telephonically, however SiVEST was informed that he was unavailable. A message was left for him. Prixley Ka Seme DM will have further opportunity to comment in the EIA phase.
DEPARTMENT OF ENVIRONMENTAL AFFAIRS BIODIVERSITY							
Mr	Lekota	Seoka		Private Bag X447 Pretoria 0001	slekota@environment.gov.za	Electronic copy on CD posted - 01 July 2016 Electronic copy emailed - 01 July 2016	Access to an electronic copy of the report was emailed on 01 July 2016 and was posted on 01 July 2016. The DEA Biodiversity acknowledged the receipt of the DSR on 29 July 2016, noting that comments would be provided. Once these are received they will be forwarded to the DEA and included in the DEIAr.
Mr	Rabothata	Mmatlala		Private Bag X447 Pretoria 0001	slekotamrabothata@environment.gov.za	Electronic copy on CD posted - 01 July 2016 Electronic copy emailed - 01 July 2016	

NORTHERN CAPE DEPT OF ENVIRONMENT AND NATURE CONSERVATION							
Mr	Fisher	Brian	Director Environmental Impact Managemen	Private Bag X86102 KIMBERLEY 8300	bfisher@ncpg.gov.za	Electronic copy on CD posted - 01 July 2016 Electronic copy emailed - 01 July 2016	Access to an electronic copy of the report was emailed on 01 July 2016 and was posted on 01 July 2016. An email reminder was sent on the 26 July 2016. Attempts were made to contact Mr Fisher telephonically to no avail. NC ENC will have further opportunity to comment in the EIA phase.
Mr	Mthombeni	Thulani		Private Bag X86102 KIMBERLEY 8300	tmtho@webmail.co.za	Electronic copy on CD posted - 01 July 2016 Electronic copy emailed - 01 July 2016	
NORTHERN CAPE DEPT OF SPORT, ARTS & CULTURE: Heritage Resources Unit							
Mr	Lenyibi	Patrick	Manager: Heritage Resources	Private Bag X5004 KIMBERLEY 8300	plenyibi@ncpg.gov.za	Electronic copy on CD posted - 01 July 2016 Electronic copy emailed - 01 July 2016	Access to an electronic copy of the report was emailed on 01 July 2016 and was posted on 01 July 2016. An email reminder was sent on the 26 July 2016. Attempts were made to contact Mr Lenyibi telephonically, however SiVEST was informed that he was in a meeting. A message was left for him. NC Dept of Sprot, Arts & Culture will have further opportunity to comment in the EIA phase.
SANRAL - WESTERN REGION							
Ms	Abrahams	Nicole	Environmental Coordinator	Private Bag X19 BELLVILLE 7535	abrahamsn@nra.co.za	Electronic copy on CD posted - 01 July 2016 Electronic copy emailed - 01 July 2016	Comment was received from SANRAL on the 04 April 2016.
NORTHERN CAPE DEPARTMENT OF ROADS AND PUBLIC WORKS							
Mr	Roelofse	Jaco	Director: Planning & Design	PO Box 3132 Kimberley 8300	roelofse.j@vodamail.co.za	Electronic copy on CD posted - 01 July 2016 Electronic copy emailed - 01 July 2016	Access to an electronic copy of the report was emailed on 01 July 2016 and was posted on 01 July 2016. An email reminder was sent on the 26 July 2016. Attempts were made to contact Mr Roelofse telephonically to no avail. NC Dept of Roads & Public Works will have further opportunity to comment in the EIA phase.
SAHRA: HEAD OFFICE							
Ms	Higgitt	Natasha	Heritage Officer: Northern Cape	PO Box 4637 CAPE TOWN 8000	nhiggitt@sahra.org.za	Electronic copy emailed - 01 July 2016	The reports were uploaded to SAHRIS on 01 July 2016. Interim comments were received from SAHRA on 28 July 2016.
ESKOM							
Mr	Geeringh	John	Chief Planner	PO Box 1091 JOHANNESBURG 2000	GeerinJH@eskom.co.za	Electronic copy on CD posted - 01 July 2016 Electronic copy emailed - 01 July 2016	Comment was received from Eskom on the 13 May 2016 and 01 July 2016.
SQUARE KILOMETRE ARRAY							
Dr	Tiplady	Adriaan	Manager: Site Categorisation	PO Box 522 SAXONWOLD 2132	atiplady@ska.ac.za	Electronic copy on CD posted - 01 July 2016 Electronic copy emailed - 01 July	Comment was received from SKA on the 18 March 2016.

SA CIVIL AVIATION AUTHORITY (SA CAA)							
Ms	Stoh	Lizell	Obstacle Specialist	Private Bag X73 HALFWAY HOUSE 1685	strohl@caa.co.za	Electronic copy on CD posted - 01 July 2016 Electronic copy emailed - 01 July 2016	Access to an electronic copy of the report was emailed on 01 July 2016 and was posted on 01 July 2016. An email reminder was sent on the 26 July 2016. Attempts were made to contact Ms Stoh telephonically to no avail. SA CAA will have further opportunity to comment in the EIA phase. The developer will also apply for obstacle approval from the SA CAA prior to construction.
AIR TRAFFIC AND NAVIGATION SERVICES (ATNS)							
Ms	Morobane	Johanna	Manager: Corporate Sustainability and Environment	Private Bag X15 KEMPTON PARK 1620	JohannaM@atns.co.za	Electronic copy on CD posted - 01 July 2016 Electronic copy emailed - 01 July 2016	Comment was received from ATNS on the 02 August 2016.
Ms	Masilela	Simphiwe	Obstacle Evaluator	Private Bag X15 KEMPTON PARK 1620	SimphiweM@atns.co.za	Electronic copy on CD posted - 01 July 2016 Electronic copy emailed - 01 July 2016	
TRANSNET FREIGHT RAIL							
Mr	Fiff	Sam	Environmental Manager: Freight Rail	PO Box 255 BLOEMFONTEIN 9300	sam.fiff@transnet.net	Electronic copy on CD posted - 01 July 2016 Electronic copy emailed - 01 July 2016	Access to an electronic copy of the report was emailed on 01 July 2016 and was posted on 01 July 2016. An email reminder was sent on the 26 July 2016. Attempts were made to contact Mr Fiff and he informed SiVEST that he will check his emails and get back to SiVEST. Transnet will have further opportunity to comment in the EIA phase.
SENTECH							
Mr	Koegelenberg	Johan	Renewable Projects	Private Bag X06 Honeydew 2040	koegelenbergj@sentech.co.za	Electronic copy on CD posted - 01 July 2016 Electronic copy emailed - 01 July 2016	Comment was received from SENTECH on t01 August 2016.
TELKOM							
Mr	Bester	Amanda	Wayleave Officer	Private Bag X20700 BLOEMFONTEIN 9300	WayleaCR@telkom.co.za BesterAD@telkom.co.za	Electronic copy on CD posted - 01 July 2016 Electronic copy emailed - 01 July 2016	Comment was received from Telkom on the 29 March 2016 and 13 July 2016.
Ms	van den Heever	Heleen	Ops Manager Central Region	Private Bag X20700 BLOEMFONTEIN 9300	vdheevhd@telkom.co.za	Electronic copy on CD posted - 01 July 2016 Electronic copy emailed - 01 July 2016	
ENDANGERED WILDLIFE TRUST							
Mr	Leeuwner	Lourens	Renewable Energy Project Manager	Private Bag X11, Modderfontein, 1609, Johannesburg	lourensl@ewt.org.za	Electronic copy on CD posted - 01 July 2016 Electronic copy emailed - 01 July 2016	Access to an electronic copy of the report was emailed on 01 July 2016 and was posted on 01 July 2016. An email reminder was sent on the 26 July 2016. Attempts were made to contact Mr Leeuwner telephonically to no avail. EWT will have further opportunity to comment in the EIA phase.

WESSA							
Mr	Griffiths	Morgan	Environmental Governance Programme Manager	PO Box 12444, Centrahil, Port Elizabeth, 6006, South Africa	morgan.griffiths@wessa.co.za	Electronic copy on CD posted - 01 July 2016 Electronic copy emailed - 01 July 2016	Access to an electronic copy of the report was emailed on 01 July 2016 and was posted on 01 July 2016. An email reminder was sent on the 26 July 2016. Attempts were made to contact Mr Griffiths and he informed SiVEST that he will check his emails and get back to SiVEST. WESSA will have further opportunity to comment in the EIA phase.
BIRDLIFE SOUTH AFRICA							
Mr	Gear	Simon	Policy and Advocacy Manager	PO Box 515 RANDBURG 2125	advocacy@birdlife.org.za	Electronic copy on CD posted - 01 July 2016 Electronic copy emailed - 01 July 2016	Comment was received from BirdLife on the 22 March 2016.

8.1 Final Scoping Report Submission

The FSR was submitted to the DEA on the 12th of August 2016. I&APs were notified on the same day and the report was made available on the SiVEST website at www.sivest.co.za, under the *Downloads* tab in the folder: *13169 Aetta Wind Energy Facility*.

9 ASSESSMENT IN TERMS OF EQUATOR PRINCIPLES

The Equator Principles are a financial industry benchmark for determining, assessing and managing social & environmental risk in project financing. A number of banks, exchanges and organisations worldwide have adopted the Principles as requirements to be undertaken for project funding on application and approval. Furthermore, certain funding institutions have not formally adopted the Principles, but require clients to be compliant with them in order to qualify for loans. The Equator Principles are summarised below:

Principle 1: Review and Categorisation
When a project is proposed for financing, the Equator Principles Funding Institution ("EPFI") will categorise the project based on the magnitude of its potential environmental and social impacts and risks.

Principle 2: Environmental and Social Assessment
For each project assessed as being either Category A or Category B, the client / borrower must conduct a Social and Environmental Assessment ("Assessment") process to address the relevant impacts and risks of the proposed project. The Assessment should also propose mitigation and management measures relevant and appropriate to the nature and scale of the proposed project.

Principle 3: Applicable Environmental and Social Standards
The Assessment will refer to the applicable IFC Performance Standards and applicable Industry Specific Environmental, Health, and Safety (EHS) Guidelines.

Principle 4: Environmental and Social Management System and Equator Principles Action Plan
The client / borrower must prepare an Environmental and Social Management System (ESMS). Further, an Environmental and Social Management Plan (ESMP) must be prepared by the client to address issues raised in the Assessment process and incorporate actions required to comply with the applicable standards. Where applicable standards are not met to the EPFI's satisfaction, the client and the EPFI will agree to an Equator Principles Action Plan to outline gaps and commitments.

Principle 5: Stakeholder Engagement
For all Category A and Category B Projects, the EPFI will require the client to demonstrate effective Stakeholder Engagement as an ongoing process in a structured and culturally appropriate manner with

Affected Communities and, where relevant, Other Stakeholders. For Projects with potentially significant adverse impacts on Affected Communities, the client will conduct an Informed Consultation and Participation process. The client will tailor its consultation process to: the risks and impacts of the Project; the Project's phase of development; the language preferences of the Affected Communities; their decision-making processes; and the needs of disadvantaged and vulnerable groups.

Principle 6: Grievance Mechanism

The EPFI will require the client, as part of the ESMS, to establish a grievance mechanism designed to receive and facilitate resolution of concerns and grievances about the Project's environmental and social performance. The grievance mechanism is required to be scaled to the risks and impacts of the Project and have Affected Communities as its primary user. It will seek to resolve concerns promptly, using an understandable and transparent consultative process that is culturally appropriate, readily accessible, at no cost, and without retribution to the party that originated the issue or concern. The mechanism should not impede access to judicial or administrative remedies.

Principle 7: Independent Review

For all Category A projects and, as appropriate, for Category B projects, an independent social or environmental expert not directly associated with the borrower must review the Assessment, AP and consultation process documentations in order to assist the EPFIs due diligence, and assess Equator Principles compliance.

Principle 8: Covenants

An important strength of the Principles is the incorporation of covenants linked to compliance. For all Projects, the client will covenant in the financing documentation to comply with all relevant host country environmental and social laws, regulations and permits in all material respects. For Category A and B projects, the client / borrower will covenant in financing documentation:

- To comply with the ESMPs and Equator Principles AP (where applicable) during the construction and operation of the Project in all material respects; and

- To provide periodic reports in a format agreed with the EPFI (with the frequency of these reports proportionate to the severity of impacts, or as required by law, but not less than annually), prepared by in-house staff or third party experts, that i) document compliance with the ESMPs and Equator Principles AP (where applicable), and ii) provide representation of compliance with relevant local, state and host country environmental and social laws, regulations and permits; and

- To decommission the facilities, where applicable and appropriate, in accordance with an agreed decommissioning plan.

Principle 9: Independent Monitoring and Reporting

To ensure ongoing monitoring and reporting over the life of the loan, EPFIs will, for all Category A projects, and as appropriate, for Category B projects, require appointment of an independent environmental and/or social expert, or require that the borrower to retain qualified and experienced external experts to verify its monitoring information, which would be shared with EPFIs.

Principle 10: Reporting and Transparency

For all Category A and, as appropriate, Category B Projects:

- The client will ensure that, at a minimum, a summary of the ESIA is accessible and available online.

- The client will publicly report GHG emission levels (combined Scope 1 and Scope 2 Emissions) during the operational phase for Projects emitting over 100,000 tonnes of CO_2 equivalent annually.

Although this report is not written in terms of the Equator Principles (EPs), it fully acknowledges that EPs will need to be complied with should funding for the project be required. In general, the following documentation will need to be considered in that regard:

- The "Equator Principles" 2013
- International Finance Corporations Performance Standards on Social and Environment, IFC, January 2012, namely:
    - Performance Standard 1: Social and Environmental Assessment and Management Systems
    - Performance Standard 2: Labour and Working Conditions
    - Performance Standard 3: Pollution Prevention and Abatement
    - Performance Standard 4: Community Health, Safety and Security
    - Performance Standard 5: Land Acquisition and Involuntary Resettlement
    - Performance Standard 6: Biodiversity Conservation and Sustainable Natural Resource Management
    - Performance Standard 7: Indigenous Peoples
    - Performance Standard 8: Cultural Heritage

- International Finance Corporation – World Bank Guidelines, General EHS Guidelines 2007.

EHS Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice. These EHS Guidelines are applied as required by the World Bank's respective policies and standards. These General EHS Guidelines are designed to be used together with the relevant Industry Sector EHS Guidelines which provide guidance to users on EHS issues in specific industry sectors.

    - The EHS Guidelines contain the performance levels and measures that are generally considered to be achievable in new facilities by existing technology at reasonable costs.

9.1 Assessment Results

This section details the current compliance level with which the wind energy facility projects meets with the Equator Principles and the related Performance Standards which are outlined below.

Table 88: Wind energy facility Compliance Level in terms of Equator Principles and Related Performance Standards.

The coding key is as follows:

Compliance Level			
Clear			
Not assessed/ determined	Not compliant	Partially compliant	Compliant

Principles	**Compliance Level**	**Reference**
General, Performance Standard 1 Environmental & Social Reporting		
1. Baseline Information		Refer to Chapter 2 – Technical Details and Chapter 5 – Description of the receiving environment
2. Alternatives (Assessment of alternatives)		Refer to Chapter 7
3. Impacts and risks		Refer to Chapter 6
4. Global impacts		N/A
5. Legal requirements		Refer to Chapter 3
6. Transboundary		N/A
7. Disadvantaged / vulnerable groups		Partly addressed in 5.15 and will be addressed as part of the EMPr during the EIA phase
8. Third party		Refer to section 1.1.
9. Mitigation measures		Partly addressed in section 6.3 and will be addressed as part of the EMPr during the EIA phase
10. Documentation process		Refer to Chapter 1, Chapter 3 Sections 3.1.1 and 3.1.2 and Chapter 7

Principles	Compliance Level	Reference
11. Action Plans		To be addressed during the EIA phase
12. Organisational capacity		To be addressed as part of the EMPr during the EIA phase
13. Training		To be addressed as part of the EMPr during the EIA phase
14. Grievance mechanism		To be addressed during the EIA phase
15. Report content		To be addressed as part of the EMPr during the EIA phase
Performance Standard 2, Labour & Working Conditions		
1. Human Resource Policy		To be addressed as part of the EMPr during the EIA phase
2. Working relationship		To be addressed as part of the EMPr during the EIA phase
3. Working conditions with and terms of employment		To be addressed as part of the EMPr during the EIA phase
4. Workers organisation		To be addressed as part of the EMPr during the EIA phase
5. Non-discrimination and equal opportunities		Refer to Chapter 2, section 2.15. This issue will also be addressed as part of the EMPr during the EIA phase
6. Grievance mechanism		To be addressed as part of the EMPr during the EIA phase
7. Occupational Health and Safety		To be addressed as part of the EMPr during the EIA phase
8. Non-employee workers		To be addressed as part of the EMPr during the EIA phase
9. Supply Chain		To be addressed as part of the EMPr during the EIA phase
10. Labour Assessment Component of a Social and Environmental Assessment		To be addressed as part of the EMPr during the EIA phase
Performance Standard 3, Pollution		
1. Pollution Prevention, Resource Conservation and Energy Efficiency		To be addressed as part of the EMPr during the EIA phase
2. Wastes		To be addressed as part of the EMPr during the EIA phase

Principles	Compliance Level	Reference
3. Hazardous material		To be addressed as part of the EMPr during the EIA phase
4. Dangerous substances		To be addressed as part of the EMPr during the EIA phase
5. Emergence preparedness and response		To be addressed as part of the EMPr during the EIA phase
6. Technical guidance – ambient considerations		To be addressed as part of the EMPr during the EIA phase
7. Greenhouse gas emissions		N/A
Performance Standard 4, Health & Safety		
1. Hazardous materials safety		To be addressed as part of the EMPr during the EIA phase
2. Environmental and natural resource issues		Refer to Chapter 6
3. Emergency preparedness and response		To be addressed in the EMPr during the EIA phase
Performance Standard 5, Land Acquisition		Refer to Chapter 4
Performance Standard 6, Biodiversity		Refer to Chapter 5, section 5.7 and Chapter 6, section 6.1.1
Performance Standard 7, Indigenous People		Refer to Chapter 8
Performance Standard 8, Cultural Heritage		Refer to Chapter 5, section 5.12 and Chapter 6, section 6.1.6

It is important to note that, most of the issues listed per performance standard in the table above will only be addressed during the EIA phase. Therefore at this stage (scoping phase), most of the issues are categorised as “not assessed/ to be determined”. Full compliance with the EPs will only be realised following EIA assessments.

10 CONCLUSIONS AND RECOMMENDATIONS

The above report provides a broad introduction to the issues that are pertinent to the proposed Aletta wind energy facility, and highlights important issues to be investigated during the EIA Phase of the project. The EIA Phase will draw on the above information and make use of the recommended specialist studies to reach an objective decision on the overall impact of the proposed development.

The EIA Phase will culminate in the compilation of detailed mitigation measures to reduce impacts, the identification of least impactful locations for the wind turbines, the identification of least impactful locations for associated infrastructure and the identification of sensitive areas within the site which may require more specific management measures. The EIA Phase will also aim to optimise and improve potential positive impacts that may result from the proposed development.

10.1 Conclusions

No specialist study conducted during the Scoping phase for the proposed development has identified any fatal flaws for the proposed Aletta project site. However, a number of potentially significant (positive and negative) environmental impacts have been identified and will need to be evaluated during the detailed EIA phase of the project. In addition, the EIA Phase will provide a more detailed comparative analysis of these potential impacts against the "no-go" alternative.

Detailed mitigation and management measures will be developed during the Environmental Management Programme (EMPr) phase of the project, in response to the detailed assessment, and will be run towards the end of EIA phase of the project. Should this project receive a positive environmental authorisation, the EMPr will guide the project proponent and appointed contractor(s) through the final design, construction and operational phases of the proposed project.

10.1.1 Summary of Findings

A summary of the findings for each identified environmental impact evaluated in the context of the proposed development (both biophysical and social) is provided in the table below.

Table 89: Summary of environmental issues identified in Specialist Studies.

Aspect	Potential impacts
Biodiversity	▪ Loss of indigenous natural vegetation during construction; ▪ Impacts on a near threatened plant species; ▪ Impacts on protected plant species; ▪ Impacts on a protected tree species; ▪ Impacts on watercourses / drainage lines and pan depressions; ▪ Mortality of populations of sedentary species during construction; ▪ Displacement of populations of mobile species; ▪ Introduction and/or spread of declared weeds and alien invasive plants in terrestrial habitats.
Avifauna	▪ Collision mortality on the wind turbines; ▪ Displacement due to disturbance during construction and operation of the wind farm; and ▪ Displacement due to habitat change and loss.

Aspect	Potential impacts
	▪ Collision with the proposed power line grid connections; and ▪ Displacement due to disturbance during the construction of the power line grid connection.
Bats	▪ Impacts on local bat diversity and population structures ▪ Impacts on vegetation utilised as foraging habitat by bats ▪ Impacts on foraging bats: Bat mortalities can occur with operating turbines due to direct blade impact or barotrauma. ▪ Impacts on migrating bats: Bat mortalities can occur with operating turbines due to direct blade impact or barotrauma. ▪ Impacts on foraging bats. Local bat diversity and population structures
Surface Water	▪ Impacts associated with the construction Lay-down Area ▪ Vehicle and Machinery Degradation Impacts ▪ Human Degradation of Flora and Fauna associated with Surface Water Resources ▪ Degradation and Removal of Soils and Vegetation in Surface Water Resources ▪ Increased Run-off, Erosion and Sedimentation Impacts ▪ Vehicle Damage to Surface Water Resources ▪ Stormwater Run-off Impacts to Surface Water Resources
Soils and Agricultural Potential	▪ Loss of agriculturally productive land ▪ Increased potential for erosion of topsoil by wind
Noise	▪ Temporary loss of “quiet” low residual noise level during construction phase for residential area within the wind energy facility boundaries. ▪ Permanent loss of “quiet” low residual noise level during operation phase for residential areas within and beyond the wind energy facility boundaries.
Visual	▪ Visual impacts of the proposed Aletta Wind Energy Facility during construction ▪ Visual impacts of the infrastructure associated with the Aletta Wind Energy Facility during construction ▪ Visual impacts of the proposed Aletta Wind Energy Facility during operation ▪ Visual impacts of the infrastructure associated with the Aletta Wind Energy Facility during operation
Heritage	▪ Impact on archaeological sites ▪ Impact on palaeontological sites
Socio-economic	▪ Increase in production and GDP-R of the national and local economies due to project capital expenditure ▪ Creation of temporary employment in the local communities and elsewhere in the country ▪ Skills development due to the creation of new employment opportunities ▪ Improved standard of living of households directly or indirectly benefiting from created employment opportunities ▪ Increase in government revenue due to investment

Aspect	Potential impacts
	▪ Potential decrease of efficacy of agricultural land ▪ Change in demographics of the area due to influx of workers and job seekers ▪ Increase in social pathologies associated with influx of migrant labourers and job seekers to the area (health, crime, prostitution, xenophobia, etc.) ▪ Added pressure on basic services and social and economic infrastructure ▪ Sustainable increase in production and GDP-R of the national and local economies through operation and maintenance activities ▪ Creation of long-term employment in local and national economies through operation and maintenance activities ▪ Skills development due to the creation of new sustainable employment opportunities ▪ Improved standard of living of households directly or indirectly benefiting from created employment opportunities ▪ Increase in government revenue stream ▪ Investment in the local communities and economic development projects as part of a Social Economic Development and Enterprise Development plan ▪ Altered sense of place
Traffic	▪ Change to the LOS on a portion of the rural highway and on the existing local roadways. ▪ Impact on the community due to the change in the total daily construction traffic.

Based on the specialist studies, the following conclusions can be reached for each environmental parameter assessed.

Table 90: Conclusions of Specialist Studies.

Biodiversity	The biodiversity specialist report concludes that the project is unlikely to have highly significant impacts on the ecological receiving environment and impacts that will occur can be controlled and reduced to low significance. The seriousness of many of these impacts can be determined during the field investigation of the site. Some impacts require permits to be issued, either by National or Provincial authorities and field data is required for the permit applications.
Avifauna	One year of pre-construction monitoring is being undertaken on the proposed site, the first field monitoring was conducted in August 2015. Displacement of priority species due to disturbance during construction phase is likely to be a temporary medium negative impact, but can be reduced to low with the application of mitigation measures. Displacement of priority species due to habitat destruction during construction phase is likely to be a medium negative impact and will remain so, despite the application of mitigation measures. Displacement of priority species due to disturbance during operational phase is likely to be of low significance and it could be further reduced through the application of mitigation measures. Collisions of priority species with the turbines in the operational phase

	are likely to be a high negative impact but it could be reduced to medium negative through the application of mitigation measures.
Bats	The study area was visited over the winter and spring seasons of 2015 as part of the bat sensitivity study. During the day, site habitats and features were investigated and long-term bat monitoring systems were installed for the purpose of the 12-month preconstruction bat sensitivity study. The data from the passive monitoring systems will be used to identify bat species at risk of fatality to wind turbines, and patterns in their activity and distributions (temporal and spatial). Active monitoring, by means of transects, was carried out over July and October 2015. There was a significant contrast in the number of bat passes detected between the different seasons. Three different bat species were detected in October 2015 namely, *Neoromicia capensis, Tadarida aegyptiaca* and *Eptesicus hottentotus*. These species are commonly found within the Cape region of South Africa.
Surface water	Database and desktop findings were scrutinised to determine the number of surface water resources for the proposed development. Findings were consolidated in the desktop level assessment using information initially obtained via the database assessment. It was determined that the following surface water resources were identified on the proposed development site: ▪ Ten watercourses (drainage lines) ▪ Twenty seven wetlands: Twenty six depression wetlands and one man-made impoundment. It was identified that several potential impacts may affect the surface water resources within the proposed development site where construction activities encroach or are in close proximity to identified surface water resources.
Soils and Agricultural Potential	Virtually all of the study area comprises shallow, often calcareous soils with rock outcrops. Coupled with these shallow soils, the very low rainfall in the area means that the only means of cultivation would be by irrigation and the Google Earth image of the area shows absolutely no signs of any agricultural infrastructure and certainly none of irrigation. The climatic restrictions mean that this part of the Northern Cape is suited at best for grazing and here the grazing capacity is low, around 20 ha/large stock unit.
Noise	The results of this scoping study indicated that the establishment of the proposed wind energy facility could have acoustical implications on noise sensitive receptors in terms of SANS 10238.
Visual	A scoping-level visual study has been conducted to identify the potential visual impact and issues related to the development of the Aletta Wind Energy Facility and associated infrastructure near Copperton in the Northern Cape Province. The study area has a rural or pastoral visual character with a low visual sensitivity. Additionally, the study area is not valued for its tourism significance. However, several wind and solar energy facilities are proposed within relatively close proximity to the proposed development. These facilities and their associated infrastructure, will significantly alter the visual character and baseline in the study

	area once constructed and make it appear to have a more industrial-type visual character. The proposed wind energy facility development is likely to visually influence nineteen (19) farmsteads / homesteads identified within the visual assessment zone, therefore these are regarded as potentially sensitive visual receptor locations. The sensitivity of the receptor locations will need to be confirmed through further assessment in the next phase of the study. The nature of the visual impacts associated with a development of this size on a receptors in the study area could be significant.
Heritage	The Heritage Scoping Report has shown that the proposed Aletta wind energy facility project may have heritage resources present on the property. This has been confirmed through archival research and evaluation of aerial photography of the sites. Evaluation of aerial photography has indicated the area that may be sensitive from an archaeological perspective. The heritage sensitivity indicated the possibility of encountering heritage sites that will require further mitigation before construction commence.
Socio-economic	No fatal flaws or contraventions from a socio-economic policy perspective exist for the implementation of the proposed project. The national, provincial, and to some extent local governments, do prioritise the development of renewable energy projects to reduce carbon emissions, create new jobs, increase economic growth and security of electricity supply. However, it is very clear that these developments need to be undertaken in a sustainable manner and should not jeopardise the growth of the other sectors; mainly agriculture, which is considered to be an economic driver in the local area, where the project is to be developed. Instead, harnessing of renewable energy sources is considered to be the means to drive development and expansion of the local agricultural activities and development of other industries. The economy is in dire need for investment that would diversify its economic base and lead to the improvement of standards of living among local households through the increased income levels and access to improved services, which can be achieved by raising the local municipality's revenue base through taxes and rates paid by new businesses. The proposed project is therefore, likely to create a positive impact on the local economic development and the socio-economic environment in the municipality in general.
Radiation Emissions (SKA)	The initial high level risk assessment was conducted to enable one to estimate the maximum permissible radiated emissions from the equipment installed within the Aletta wind energy facility, compared to known radiated emission data from the Acciona AW125/3000 Wind Turbine Generator (WTG). Acciona AW125/3000 WTG is a large turbine type and was used to show the typical impacts of a similar technology and sized turbine. The report concluded that based on the current SKA location information, a first order impact analysis shows a possible interference scenario between the Aletta wind energy facility and the nearest SKA installation at 21.43km separation distance. Mitigation measures were included to maintain impacts below an acceptable level. ITC noted that Shielding and filtering solutions are available to ensure installed plant equipment emissions remain within SKA risk tolerances.

	SKA was provided with the MESA and ITC assessments and the initial Aletta turbine layout. SKA stated that as it stands the facility posed a high risk to the SKA and that a detailed emission measurements campaign must be conducted and an Emissions Control Plan, which provides sufficient evidence and proof of the mitigation required and that it is technically achievable must be compiled. BioTherm appointed ITC to conduct a detailed Path Loss and Risk Assessment including an Emissions Control Plan (ECP) to address the mitigation actions required to reduce the radiation emissions of the wind turbine generator levels to levels acceptable for installation within the Karoo Central Astronomy Advantage Area. The assessment and ECP was based on the 60 turbine layout which is proposed to be further assessed during the EIA phase. The 60 turbine layout not only reduces the number of turbines but also increases the distance from the closest turbine to the closest SKA infrastructure from 20km to 25km. ITC previously worked on the Copperton and Garob Wind Energy Facilities of which were selected as Preferred Bidders under Round 4.5 of the REIPPP program. Both these Wind Energy Facilities are adjacent to the proposed Aletta Wind Energy Facility. The detailed Path Loss and Risk Assessment and ECP were completed during the scoping phase. It was found that the current requirement is a 30dB reduction in radiated emissions to ensure the cumulative emission level of a wind farm is within the requirements of SKA. As a working system was available for measurements, actual values were used rather than a theoretic analysis. Tests were done on a current wind turbine generator to confirm the suspected noise sources. The results indicated that shielding is required at frequencies in the FM Radio band as well as other controlled frequency bands, especially in the nacelle area. A number of mitigation solutions were recommended which include; implanting shield wires, control loop areas, ferrites land absorbers and improving shielding. It was concluded that by implementing the suggested mitigation measures, the impact on the SKA project will be reduced. Where possible, the mitigation measures will be verified by means of laboratory tests and ambient measurements should be done at the new site before construction starts.
Traffic	All the components will be transported by truck from Saldanha harbour to the site on vehicles classified as oversize vehicles and permits must be obtained in order to transport the turbine components. The access to the site is off road R357 which is a Provincial road and will necessitate the involvement of the Northern Cape Provincial roads and transport department. SANRAL Western Region will also need to be contacted in order to obtain consent for the abnormal load transport on their roadways. Adequate traffic accommodation signage must be erected and maintained on either side of the access on road R357 throughout the construction period.

	The impact of the construction traffic on the general traffic and the surrounding communities along the haulage route was considered to be low. The development of Aletta WEF on the Farm Drielings Pan 101 in the Northern Cape Province was therefore supported from a traffic engineering perspective.

10.2 Recommendations

Table 91: Outcomes and Recommendations of Specialist Studies

Aspect	Fatal flaws	Site refinement / Recommendations	Further Investigations
Biodiversity	None	The displacement of mobile fauna is considered to be unlikely to be important for this site and project. All other potential impacts should be investigated in the EIA phase or should be assessed using formal methodology.	Yes
Avifauna	None	The conclusions above are preliminary and subject to the outcome of a monitoring programme which is currently underway at the site.	Yes
Bats	None	A sensitivity map based on species ecology and habitat preferences has been created. The map can be used as a tool to improve turbine placement with regards to bat preferred habitats in the study area.	Yes
Surface water	None	Specialist recommendations include undertaking a detailed field assessment to groundtruth and accurately delineate desktop identified surface water resources and mapped accordingly. Additionally, the impact assessment will need to be revisited to determine whether potential impacts and related mitigation measures as stipulated in this report are relevant and applicable once wind turbine and building layout options become available. Lastly, mitigation measures for potential wind turbine collision of avi-fauna especially around surface water resources as advised by the avi-fauna specialist must be adhered to, as these are not provided in this assessment.	Yes

Aspect	Fatal flaws	Site refinement / Recommendations	Further Investigations
Agricultural potential	None	Due to the occurrence of shallow soils, coupled with the extremely hot and dry nature of the climate, it is not anticipated that a detailed soil survey will be required.	Yes, due to comments made by the DEA on the DSR, a detailed EIA phase investigation will be conducted.
Noise	None	The results of this scoping study indicated that the establishment of the proposed wind energy facility could have acoustical implications on noise sensitive receptors in terms of SANS 10238.	Yes
Visual	None	Further assessment will be required in the EIA-phase to investigate the sensitivity of the receptor locations to visual impacts associated with the proposed development and to quantify the impacts that would result.	Yes
Heritage	None	These findings provide the basis for the recommendation of further field truthing through an archaeological walk down and palaeontological desktop study covering the site. The aim of this will be to compile a comprehensive database of heritage sites in the study areas, with the aim of developing a heritage management plan for inclusion in the Environmental Management Plan as derived from the EIA.	Yes
Socio-economic	None	The previously listed potential impacts will need to be investigated in the EIA phase in greater detail.	Yes
Traffic	None	Further investigations are required for specific key intersections to assess the impact to the geometry and function of the intersection.	Yes

It is therefore recommended that the following studies be taken through to the EIA Phase:

- Biodiversity (flora and fauna) Assessment (Dr. David Hoare – David Hoare Consulting)
- Avifauna Assessment (Chris van Rooyen - Chris van Rooyen Consulting)
- Bat Assessment (Werner Marais and Monika Moir – Animalia)
- Surface Water Impact Assessment (Shaun Taylor– SiVEST) – including external peer review by Michiel Jonker – Ecotone Freshwater Consultants

- Soils and Agricultural Potential Assessment (D.G. Paterson – ARC Institute for Soil, Climate and Water)
- Visual Impact Assessment (Andrea Gibb – SiVEST) – including external peer review by Keagan Allan – SRK Consulting
- Heritage Assessment (Wouter Fourie – PGS Heritage)
- Noise Assessment (Adrian Jongens – Jongens Keet Associates)
- Socio-economic Impact Assessment (Ruan Fourie and Elena Broughton – Urban-Econ Development Economists)
- Traffic Assessment (Dirk van der Merwe – BVi Consulting Engineers)

The proposed scope of work and methodology to assess each of the above impacts has been detailed in the plan of study to undertake an EIA, as per the EIA Regulations. The Plan of Study is included below.

11 PLAN OF STUDY FOR ENVIRONMENTAL IMPACT ASSESSMENT

Issues identified during the Scoping phase will be investigated further during the EIA phase of the project. Various specialist studies will be conducted during the EIA phase to assess these issues. Mitigation measures will be formulated and these will be included in the Environmental Management Programme (EMPr).

This information will assist DEA in making an informed decision with regards to the proposed development.

11.1 Aim of the EIA Phase

The aim of the impact assessment phase is to:

- Conduct a detailed impact assessment of the issues identified
- Identify potential mitigation measures to reduce impacts
- Ensure information is disseminated to Interested and / or Affected parties and there is a constant flow of communication

The following tasks will form part of the Environmental Impact Assessment Phase:

- A comprehensive Public Participation Process (as above)
- Conduct specialist studies
- Conduct alternatives assessment on the alternative layouts identified in this FSR
- Compilation of an Environmental Impact Assessment Report (EIAr)
- Compilation of an Environmental Management Programme (EMPr)
- Make Final EIAr available for public comment
- Submit Final EIAr to DEA
- Await decision

The following specialist studies will form part of the EIAr:

- Biodiversity (flora and fauna) Assessment (Dr. David Hoare – David Hoare Consulting)
- Avifauna Assessment (Chris van Rooyen - Chris van Rooyen Consulting)
- Bat Assessment (Werner Marais and Monika Moir – Animalia)
- Surface Water Impact Assessment (Shaun Taylor– SiVEST) – including external peer review by Michiel Jonker – Ecotone Freshwater Consultants
- Soils and Agricultural Potential Assessment (D.G. Paterson – ARC Institute for Soil, Climate and Water)
- Visual Impact Assessment (Andrea Gibb – SiVEST) – including external peer review by Keagan Allan – SRK Consulting
- Heritage Assessment (Wouter Fourie – PGS Heritage)

- Noise Assessment (Adrian Jongens – Jongens Keet Associates)
- Socio-economic Impact Assessment (Ruan Fourie and Elena Broughton – Urban-Econ Development Economists)
- Traffic Assessment (Dirk van der Merwe – BVi Consulting Engineers)

The terms of reference for these studies involve assessing the potential impacts that have been identified in the Scoping Report in addition to any new issues that are identified during the detailed assessments. The qualifications of these specialists are included in their CV's which are included in Appendix 2.

11.2 Authority Consultation

The stages at which the competent authority will be consulted are as follows:

- Submission of draft Environmental Impact Assessment Report for comment;
- Submission of final Environmental Impact Assessment Report with comments; and
- Response from competent authority regarding acceptance of final Environmental Impact Assessment Report.

Additional consultation may occur with the DEA during the EIA process should the need arise.

11.3 Proposed Method of Assessing Environmental Issues

The EIA Methodology assists in evaluating the overall effect of a proposed activity on the environment. The determination of the effect of an environmental impact on an environmental parameter is determined through a systematic analysis of the various components of the impact. This is undertaken using information that is available to the environmental practitioner through the process of the environmental impact assessment. The impact evaluation of predicted impacts was undertaken through an assessment of the significance of the impacts.

A brief Terms of Reference for each specialist study is included below:

11.3.1 Biodiversity Assessment

The scoping study provided a general assessment of potential impacts on flora, vertebrate fauna and ecology by the proposed project. The ecological impact assessment will aim to determine potential impacts of the proposed project on the ecological receiving environment.

The general approach that will be adopted for this study will be to identify any critical biodiversity issues that may lead to the decision that the proposed project cannot take place, i.e. to specifically focus on red flags and/or potential fatal flaws. Biodiversity issues will be assessed by documenting whether any

important biodiversity features occur on site, including species, ecosystems or processes that maintain ecosystems and/or species. The assessment will be based on a combination of desktop studies, field-based studies and detailed mapping from aerial photographs.

During the scoping study a description and characterisation of the broad study area was undertaken. A description of the receiving environment was provided and any major sensitivities within the study area were identified. Potential impacts on biodiversity, sensitive habitats and ecosystem function were listed and described.

During the EIA phase the study area will be visited and assessed in order to confirm patterns identified from the desktop assessment. Specific features of potential concern will be investigated in the field, including the following:

- General vegetation status;
- Presence of habitats of conservation concern;
- Presence of protected trees;
- Potential presence of species of concern.

The EIA phase will also consider an assessment of alternatives and the cumulative impacts associated with other renewable energy projects in the area.

Impacts identified from the Scoping (Desktop) Phase will be assessed according to standard criteria (nature, extent, duration, magnitude, probability, significance, status as well as the degree to which impacts can be reversed, the degree to which impacts will cause irreplaceable loss of resources and the degree to which impacts can be mitigated).

11.3.2 Avifauna Assessment

The EIA phase avifaunal report will contain the results of preconstruction monitoring. The monitoring protocol for the site is designed according to the latest version (2012) of Jenkins A R; Van Rooyen C S; Smallie J; Anderson M D & Smit H A. 2011. Best practice guidelines for avian monitoring and impact mitigation at proposed wind energy development sites in southern Africa. Endangered Wildlife Trust and Birdlife South Africa.

The first monitoring survey was conducted at the proposed turbine site and a control site by four field monitors during August 2015.

Monitoring is conducted in the following manner:

- One drive transect was identified totalling 19.6km on the turbine site and one drive transect in the control site with a total length of 10km.
- Two observers travelling slowly (± 10km/h) in a vehicle records all species on both sides of the transect. The observers stop at regular intervals (every 500 m) to scan the environment with binoculars. Transects are counted three times per sampling session.
- In addition, seven walk transects of 1km each were identified at the turbine site, and two at the control site, and counted 8 times per sampling season. All birds are recorded during walk transects.

- The following variables are recorded:

    - Species;
    - Number of birds;
    - Date;
    - Start time and end time;
    - Distance from transect (0-50 m, 50-100 m, >100 m);
    - Wind direction;
    - Wind strength (calm; moderate; strong);
    - Weather (sunny; cloudy; partly cloudy; rain; mist);
    - Temperature (cold; mild; warm; hot);
    - Behaviour (flushed; flying-display; perched; perched-calling; perched-hunting; flying-foraging; flying-commute; foraging on the ground); and
    - Co-ordinates (priority species only).

- Seven vantage points (VPs) were identified from which the majority of the proposed turbine area can be observed (the "VP area"), to record the flight altitude and patterns of priority species. One VP was also identified on the control site. The following variables were recorded for each flight:

    - Species;
    - Number of birds;
    - Date;
    - Start time and end time;
    - Wind direction;
    - Wind strength (estimated Beaufort scale 1-7);
    - Weather (sunny; cloudy; partly cloudy; rain; mist);
    - Temperature (cold; mild; warm; hot);
    - Flight altitude (high i.e. >220m; medium i.e. 30m – 220m; low i.e. <30m);
    - Flight mode (soar; flap; glide ; kite; hover); and
    - Flight time (in 15 second-intervals).

The aim with drive transects is primarily to record large priority species (i.e. raptors and large terrestrial species), while walk transects are primarily aimed at recording small passerines. The objective of the transect monitoring is to gather baseline data on the use of the site by birds in order to measure potential displacement by the wind farm activities. The objective of vantage point counts is to measure the potential collision risk with the turbines. Priority species will be identified using the November 2014 BLSA list of priority species for wind farms.

11.3.3 Bat Assessment

Four seasons of preconstruction monitoring will be undertaken in order to identify bat species at risk of fatality to wind turbines, patterns in their activity and distribution (temporal and spatial).

Bat activity will be monitored using active and passive bat monitoring techniques. Active monitoring will be carried out with the use of a mobile bat detector. The bat detector will be mounted on a vehicle and transects will be driven across the site. Transect routes will be randomly selected based on availability and accessibility of roads across the site. A SM2BAT+ bat detector will be used for this monitoring technique. Passive detection commenced in July 2015. The monitoring systems consists of SM2BAT+ time expansion type bat detectors that are powered by 12V 18Ah sealed lead acid batteries and 20W solar panels that provide recharging power to the batteries. Each system also has an 8-amp low voltage protection regulator and SM2PWR step down transformer. Four SD memory cards, class 10 speed, with a capacity of 32GB each were utilized within each SM2BAT+ detector; this is to ensure substantial memory space with high quality recordings even under conditions of multiple false wind triggers.

Two weatherproof ultrasound microphones were mounted at heights of 9.5 meters on the short 10m masts, while two microphones were mounted at 10m and 80m heights on the meteorological mast. These microphones were then connected to the SM2BAT+ bat detectors.

Each detector was set to operate in continuous trigger mode from dusk each evening until dawn (times were correlated with latitude and longitude). Trigger mode is the setting for a bat detector in which any frequency which exceeds 16 KHz and 18 dB will trigger the detector to record for the duration of the sound and 500 ms after the sound has ceased, this latter period is known as a trigger window. All signals are recorded in WAC0 lossless compression format.

11.3.4 Soils and Agricultural Potential Impact Assessment

The soils and agricultural potential assessment during the EIA phase would primarily entail more detailed field investigation of agricultural potential within the project site. The assessment will include thorough ground truthing, with the following terms of reference to be undertaken:

- Assessment of the loss of agricultural land;
- The current state of agricultural activities on land;
- The impact of the loss of agricultural land within the property as well as the cumulative impact of the loss of agricultural land on the site and within the area.

11.3.5 Surface Water Impact Assessment

The surface water assessment during the EIA phase would primarily entail more detailed field investigation of surface water bodies (identified during the scoping phase) within the project site.

The fieldwork would be focused on:

- Larger wetland and drainage systems;
- Those wetland systems identified as sensitive or as having a high functionality; and
- Riparian zones of larger river systems.

The primary aim of the EIA-level assessment would be to determine the boundaries of the relevant wetland / riparian systems so that the wind energy facility can be placed outside of the wetlands /

riparian areas. The wetland / riparian area boundary delineation would be undertaken using the DWAF guideline 'A practical field procedure for the identification and delineation of wetlands and riparian areas'.

The surface water analysis would propose measures to mitigate any identified potential negative impacts associated with the wind energy facility, and these would inform the EMPr phase. Mitigation measures would possibly entail slight changes to the proposed locations and extent of the wind energy facility to avoid impacts on surface water bodies, where significant or likely impacts have been predicted.

Input will be given to the proposed layout and buffers recommended.

The study will culminate in the compilation of a Surface Water Impact Assessment as well as mitigation measures which will feed into the Environmental Management Programme (EMPr).

The Surface Water Impact Assessment Report will be peer reviewed by an external surface water specialist and the report will be updated based on the peer reviewers' comments prior to finalisation.

11.3.6 Noise Impact Assessment

A detailed noise impact study is to be conducted in accordance with Section 8 of SANS 10328. A summary of the procedure is outlined hereunder.

- Determine the land use zoning on surrounding land and identify noise sensitive receptors that could be impacted upon by activities relating to the construction, operation and decommissioning of the wind farm.
- Determine the existing ambient levels of noise within the study area.
- Determine the typical rating level for noise on surrounding land at identified noise sensitive receptors.
- Identify all noise sources, relating to the establishment and operation of the proposed wind farm that could potentially result in a noise impact on surrounding land and at the identified noise sensitive receptors.
- Determine the sound power emission levels and nature of the sound emission from the identified noise sources.
- Calculate the expected rating level of noise on surrounding land and at the identified noise sensitive receptors from the combined sound power levels emanating from identified noise sources in accordance with procedures contained in SANS 10357.
- Calculate and assess the noise impact on surrounding land and at the identified noise sensitive receptors in terms of SANS 10103 and the Noise Control Regulations.
- Investigate alternative noise mitigation procedures, if required, in collaboration with the design engineers of the facility and estimate the impact of noise upon implementation of such procedures.
- Prepare and submit an environmental noise impact report containing the procedures and findings of the investigation.

- Prepare and submit recommended noise mitigation procedures as part of a separate environmental noise management plan, if relevant.

The following information is required in order to conduct detailed noise impact study:

- Digital Terrain Model with 3-dimensional topographical data of the wind farm and land extending 5 000 m beyond the wind farm boundaries and 3-dimensional location of all turbines. File format: X, Y, Height in Excel or text files; all GEO-referenced to WGS_1984 World co-ordinates (not South African) and Transverse Mercator projection.
- Manufacturer, hub height, rotor diameter and noise emission data of the wind turbines in the form of 1/3rd octave frequency band sound power levels extending from 20Hz through 8000Hz for various wind operating speeds and tonality audibility values at respective frequencies as measured in accordance with Section 7 of IEC 61400-11 Wind turbines – acoustic noise measurement techniques. A copy of the full IEC 61400-11 test report would be preferable.

11.3.7 Visual Impact Assessment

The focus of the EIA phase VIA will be to undertake a more detailed GIS-based assessment, to quantify the magnitude and significance of the visual impacts of the proposed development in both a day-time and night-time context.

This assessment will focus on areas where potential sensitive receptors are located. Should data be available, digital terrain models and viewsheds will be generated for the areas of focus. This analysis will be conducted using ArcGIS software in conjunction with the Spatial Analyst and 3D Analyst extensions where necessary. The assessment will rely on site visits to each potentially sensitive receptor location (where possible) to identify the extent of visual impact of the proposed wind energy facility from these locations. A further assessment of the intensity of potential visual impact, expressed in terms of bands of differing visual significance will be undertaken. The fieldwork will also allow for the correction and refinement of the baseline information.

The overall significance of visual impacts associated with the proposed wind energy facility will be assessed through a rating matrix. Once this has been undertaken, measures to mitigate potential visual impacts will be identified, and if practical, layout alternatives within the application site will be considered and suggested to minimise visual impact of the proposed development.

A separate rating matrix will be used to assess the visual impact of the proposed development on the sensitive receptor locations, as identified. This matrix is based on the distance of a receptor from the proposed development, the primary focus / orientation of the receptor, the presence of screening factors, the visual character and sensitivity of the area and the visual contrast of the development with the typical elements and forms in the landscape.

Thereafter, the alternatives will be comparatively assessed, in order to ascertain the preferred alternative from a visual perspective.

Interested and Affected Parties will be consulted through the public participation process being undertaken as part of the EIA process, in order to establish how the proposed wind energy facility will be perceived from the various receptor locations and the degree to which this impact will be regarded as negative.

It is envisaged that the main deliverable of the study would be the generation of a spatial databases / maps indicating the zones of visual impact, as well as a detailed report indicating the findings of the study.

The VIA report will be peer reviewed by an external visual specialist and the report will be updated based on the peer reviewers' comments prior to finalisation.

11.3.8 Heritage Assessment

The Heritage Impact Assessment (HIA) report to be compiled by PGS Heritage (PGS) for the proposed Aletta project will assess the heritage resources found on site. This report will contain the applicable maps, tables and figures as stipulated in the NHRA (no 25 of 1999) and the National Environmental Management Act (NEMA) (no 107 of 1998). The HIA process consists of three steps:

- Step I – Literature Review: The background information to the field survey leans greatly on the Heritage Scoping Report completed by PGS for this site.

- Step II – Physical Survey: A physical survey will be conducted on foot through the proposed project area by qualified archaeologists, aimed at locating and documenting sites falling within and adjacent to the proposed development footprint.

- Step III – The final step involves the recording and documentation of relevant archaeological resources, as well as the assessment of resources in terms of the heritage impact assessment criteria and report writing, as well as mapping and constructive recommendations

The significance of heritage sites is based on four main criteria:

- **site integrity** (i.e. primary vs. secondary context),
- **amount of deposit, range of features** (e.g., stonewalling, stone tools and enclosures),
    - Density of scatter (dispersed scatter)
        - Low - <10/50m^2
        - Medium - 10-50/50m^2
        - High - >50/50m^2
- **uniqueness** and
- **potential** to answer present research questions.

Management actions and recommended mitigation, which will result in a reduction in the impact on the sites, will be expressed as follows:

A - No further action necessary;
B - Mapping of the site and controlled sampling required;
C - No-go or relocate pylon position
D - Preserve site, or extensive data collection and mapping of the site; and
E - Preserve site

Site Significance

Site significance classification standards prescribed by the South African Heritage Resources Agency (2006) and approved by the Association for Southern African Professional Archaeologists (ASAPA) for the Southern African Development Community (SADC) region, were used for the purpose of this report.

Table 92: Site significance classification standards as prescribed by SAHRA

FIELD RATING	GRADE	SIGNIFICANCE	RECOMMENDED MITIGATION
National Significance (NS)	Grade 1	-	Conservation; National Site nomination
Provincial Significance (PS)	Grade 2	-	Conservation; Provincial Site nomination
Local Significance (LS)	Grade 3A	High Significance	Conservation; Mitigation not advised
Local Significance (LS)	Grade 3B	High Significance	Mitigation (Part of site should be retained)
Generally Protected A (GP.A)	Grade 4A	High / Medium Significance	Mitigation before destruction
Generally Protected B (GP.B)	Grade 4B	Medium Significance	Recording before destruction
Generally Protected C (GP.A)	Grade 4C	Low Significance	Destruction

11.3.9 Socio-economic Impact Assessment

A socio-economic impact assessment will be conducted during the EIA phase in order to:

- Delineate the zone of influence that stretches beyond the directly affected sites following the discussions with other specialists on the team
- Collect primary socio-economic data (through personal or telephonic interviews) of the communities and economic activities that will be directly or indirectly affected (positively or negatively) by the proposed developments (per project and its components)
- Quantify the potential positive and negative effects of the proposed project and its alternatives (if applicable) on the socio-economic environment in the delineated study area;
- Evaluate the change in the size and composition of the local and regional economies that will be stimulated by the proposed development, as well as the state of local communities
- Evaluate the potential positive and negative impacts following the environmental specialist's methodology

- Assess cumulative impacts
- Develop a management and mitigation plan by proposing mitigation measures for negative effects and enhancement measures for positive impacts, supported by methods for the implementation, timeframes, costs and responsibilities information

The following methods will be employed in undertaking the study.

- Surveys and interviews

  Surveying is one of the fastest ways to obtain primary information. Surveys can be conducted over the telephone, internet, e-mail, or personal interviews. The latter is relatively expensive but since it involves one person interviewing another, it is a way to get in-depth and comprehensive information. The use of surveys and interviews is particular applicable for collecting primary data of the community that could potentially be affected by the project or collecting specific data from an identified official or stakeholder.

  The following data will be sourced using surveys and interviews:
    - Land use information and type of economic activity on properties within the affected environment
    - Economic profiles of the activities within the affected environment
    - Demographic and social characteristics of the local environment (population, income levels, crime levels, etc.)

- Mapping

  Land use mapping technique would be used to illustrate and analyse the land uses in the affected area. The map will be created based on the information collected during the surveys and include the following data:
    - Types and location of tourism facilities in the area
    - Land uses in the area surrounding the facility (defined by the visual impact)

- Economic modelling and impact assessment

  Assessment of economic impacts will be done using economic models developed for the South African economy and the North West Province. The former will be used to assess the impacts on the country's economy, whilst the latter will be used to estimate the impact on the provincial and local economies.

  Economic models are compiled on the basis of Social Accounting Matrices that illustrate the linkages between various economic agents. The use of economic models allows identifying the industry-specific multipliers on production, capital formation, Gross Domestic Product (GDP), employment, and income. Such multipliers can also be broken in terms of various effects that can be observed as a result of an exogenous change introduced into the economy, be it capital investment or operating expenditure. Three types of effects are distinguished, inter alia:

- Direct – these represent the original purchases for the project's establishment or operations
- Indirect – these are effects that spill over the industries that supply goods and services required for the implementation of the project or for its operation, whether directly to the contractor or operator, or through their suppliers
- Induced – these are the effects that are stimulated by the change in income levels of households that would directly or indirectly be affected by the project and businesses.

11.3.10 Updated Electromagnetic Interference Assessment based on modified layout and a detailed Emission Control Plan

In May 2016, ITC went to Spain to the Acciona turbine test facility and conducted an in depth measurement campaign over several days in order to pin point the exact emission sources. With this detailed information ITC have undertaken the following:

- A risk assessment based on the 60 turbine layout and the increased buffer distance
- Compiled a detail Emissions Control Plan for the facility

This report has been sent to the SKA for comment. Once comments are received from the SKA, the report will be updated as required and included in the DEIAr for further comment.

11.3.11 Traffic Assessment

A Traffic Impact Assessment will be undertaken in the EIA phase in order to further investigate specific key intersections. The following will be assessed as part of the study:

- Intersection geometry
- Intersection function

It is envisaged that the main deliverable of the study would be an update to the previously compiled traffic assessment report in order to assess specific intersections.

11.4 Cumulative Impact Assessment

The potential cumulative impact of the proposed wind facility in combination with other renewable energy facilities in the area will be identified and assessed per environmental aspect and mitigation measures will be identified to address the cumulative impact, where possible. The EIA phase specialist reports will include a detailed cumulative impact assessment, including a review of other specialist studies conducted for renewable energy projects in the area. The recommendations contained in the specialist reports will be reflected in the mitigation measures to be provided in the DEIAr and EMPr. Cumulative impacts will also be rated as part of the impact rating system and used to determine the significance of the impacts.

11.5 Determination of Significance of Impacts

Significance is determined through a synthesis of impact characteristics which include context and intensity of an impact. Context refers to the geographical scale i.e. site, local, national or global whereas Intensity is defined by the severity of the impact e.g. the magnitude of deviation from background conditions, the size of the area affected, the duration of the impact and the overall probability of occurrence. Significance is calculated as shown in Table 94.

Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The total number of points scored for each impact indicates the level of significance of the impact.

11.6 Impact Rating System

Impact assessment will take account of the nature, scale and duration of effects on the environment whether such effects are positive (beneficial) or negative (detrimental). Each issue / impact will also be assessed according to the project stages:

- Planning;
- Construction;
- Operation; and
- Decommissioning.

Where necessary, the proposal for mitigation or optimisation of an impact will be detailed. A brief discussion of the impact and the rationale behind the assessment of its significance is also been included.

11.6.1 Rating System Used To Classify Impacts

The rating system will be applied to the potential impact on the receiving environment and includes an objective evaluation of the mitigation of the impact. Impacts will be consolidated into one rating. In assessing the significance of each issue the following criteria (including an allocated point system) is used:

Table 93: Description of terms.

NATURE
Include a brief description of the impact of environmental parameter being assessed in the context of the project. This criterion includes a brief written statement of the environmental aspect being impacted upon by a particular action or activity.

GEOGRAPHICAL EXTENT		
This is defined as the area over which the impact will be expressed. Typically, the severity and significance of an impact have different scales and as such bracketing ranges are often required. This is often useful during the detailed assessment of a project in terms of further defining the determined.		
1	International and National	Will affect the entire country
2	Province/region	Will affect the entire province or region
3	Local/district	Will affect the local area or district
4	Site	The impact will only affect the site
PROBABILITY		
This describes the chance of occurrence of an impact		
1	Unlikely	The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).
2	Possible	The impact may occur (Between a 25% to 50% chance of occurrence).
3	Probable	The impact will likely occur (Between a 50% to 75% chance of occurrence).
4	Definite	Impact will certainly occur (Greater than a 75% chance of occurrence).
REVERSIBILITY		
This describes the degree to which an impact on an environmental parameter can be successfully reversed upon completion of the proposed activity.		
1	Irreversible	The impact is irreversible and no mitigation measures exist.
2	Barely reversible	The impact is unlikely to be reversed even with intense mitigation measures.
3	Partly reversible	The impact is partly reversible but more intense mitigation measures are required.
4	Completely reversible	The impact is reversible with implementation of minor mitigation measures
IRREPLACEABLE LOSS OF RESOURCES		
This describes the degree to which resources will be irreplaceably lost as a result of a proposed activity.		
1	No loss of resource.	The impact will not result in the loss of any resources.
2	Marginal loss of resource	The impact will result in marginal loss of resources.
3	Significant loss of resources	The impact will result in significant loss of resources.
4	Complete loss of resources	The impact is result in a complete loss of all resources.
DURATION		

This describes the duration of the impacts on the environmental parameter. Duration indicates the lifetime of the impact as a result of the proposed activity		
1	Short term	The impact and its effects will either disappear with mitigation or will be mitigated through natural process in a span shorter than the construction phase (0 – 1 years), or the impact and its effects will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).
2	Medium term	The impact and its effects will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).
3	Long term	The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 50 years).
4	Permanent	The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered transient (Indefinite).
CUMULATIVE EFFECT		
This describes the cumulative effect of the impacts on the environmental parameter. A cumulative effect/impact is an effect which in itself may not be significant but may become significant if added to other existing or potential impacts emanating from other similar or diverse activities as a result of the project activity in question.		
1	Negligible Cumulative Impact	The impact would result in negligible to no cumulative effects
2	Low Cumulative Impact	The impact would result in insignificant cumulative effects
3	Medium Cumulative impact	The impact would result in minor cumulative effects
4	High Cumulative Impact	The impact would result in significant cumulative effects
INTENSITY / MAGNITUDE		
Describes the severity of an impact		
1	Low	Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.
2	Medium	Impact alters the quality, use and integrity of the system/component but system/ component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).

3	High	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.
4	Very high	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired (system collapse). Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.

SIGNIFICANCE

Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. This describes the significance of the impact on the environmental parameter. The calculation of the significance of an impact uses the following formula:

(Extent + probability + reversibility + irreplaceability + duration + cumulative effect) x magnitude/intensity.

The summation of the different criteria will produce a non-weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating.

Points	Impact Significance Rating	Description
6 to 28	Negative Low impact	The anticipated impact will have negligible negative effects and will require little to no mitigation.
6 to 28	Positive Low impact	The anticipated impact will have minor positive effects.
29 to 50	Negative Medium impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures.
29 to 50	Positive Medium impact	The anticipated impact will have moderate positive effects.
51 to 73	Negative High impact	The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact.
51 to 73	Positive High impact	The anticipated impact will have significant positive effects.

74 to 96	Negative Very high impact	The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws".
74 to 96	Positive Very high impact	The anticipated impact will have highly significant positive effects.

The table below is to be represented in the Impact Assessment section of the report.

Table 94: Rating of impacts.

IMPACT TABLE		
Environmental Parameter	*A brief description of the environmental aspect likely to be affected by the proposed activity e.g. Surface water*	
Issue/Impact/Environmental Effect/Nature	*A brief description of the nature of the impact that is likely to affect the environmental aspect as a result of the proposed activity e.g. alteration of aquatic biota The environmental impact that is likely to positively or negatively affect the environment as a result of the proposed activity e.g. oil spill in surface water*	
Extent	*A brief description indicating the chances of the impact occurring*	
Probability	*A brief description of the ability of the environmental components recovery after a disturbance as a result of the proposed activity*	
Reversibility	*A brief description of the environmental aspect likely to be affected by the proposed activity e.g. Surface water*	
Irreplaceable loss of resources	*A brief description of the degree in which irreplaceable resources are likely to be lost*	
Duration	*A brief description of the amount of time the proposed activity is likely to take to its completion*	
Cumulative effect	*A brief description of whether the impact will be exacerbated as a result of the proposed activity*	
Intensity/magnitude	*A brief description of whether the impact has the ability to alter the functionality or quality of a system permanently or temporarily*	
Significance Rating	*A brief description of the importance of an impact which in turn dictates the level of mitigation required*	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	4	1
Probability	4	1
Reversibility	4	1
Irreplaceable loss	4	1

IMPACT TABLE		
Duration	4	1
Cumulative effect	4	1
Intensity/magnitude	4	1
Significance rating	-96 (high negative)	-6 (low negative)
Mitigation measures	*Outline/explain the mitigation measures to be undertaken to ameliorate the impacts that are likely to arise from the proposed activity. Describe how the mitigation measures have reduced/enhanced the impact with relevance to the impact criteria used in analysing the significance. These measures will be detailed in the EMPR.*	

11.7 Environmental Management Programme (EMPr)

In accordance with the EIA Regulations, 2014 a draft Environmental Management Programme (EMPr) will be included within the Environmental Impact Assessment Report. The EMPr will include the mitigation measures formulated by the various specialists.

11.8 Alternative Assessment

In accordance with the EIA Regulations, 2014 and as discussed in Chapter 7 of this report, the layout alternatives identified within this FSR will be described and comparatively assessed in the EIA phase. The 60 turbine layout was clearly selected as the preferred alternative as per the scoping phase specialist findings. Although 60T Substation and O&M Buildings Option 1 was slightly preferred over Option 2, both alternatives were favourable and it is recommended that both alternatives be taken through to the EIA phase for further assessment. The layout of the turbines, Substation and O&M Buildings will be adjusted based on more detailed specialist studies. These layouts are presented in **Figure 47**, and they include the following:

- Two (2) alternative sites for the substation
- Two (2) alternative sites for the O&M buildings

As previously stated, the sensitive areas used to determine the layouts were based on desktop studies, it is recommended that further studies be done on the proposed site alternatives during the EIA phase, including specialist fieldwork. The specialist studies in the EIA phase will provide a more detailed assessment of sensitive areas. If necessary, the 60 turbine layout and/or the proposed locations for the substation and O&M building may be amended at this stage to more accurately avoid highly sensitive or no-go areas.

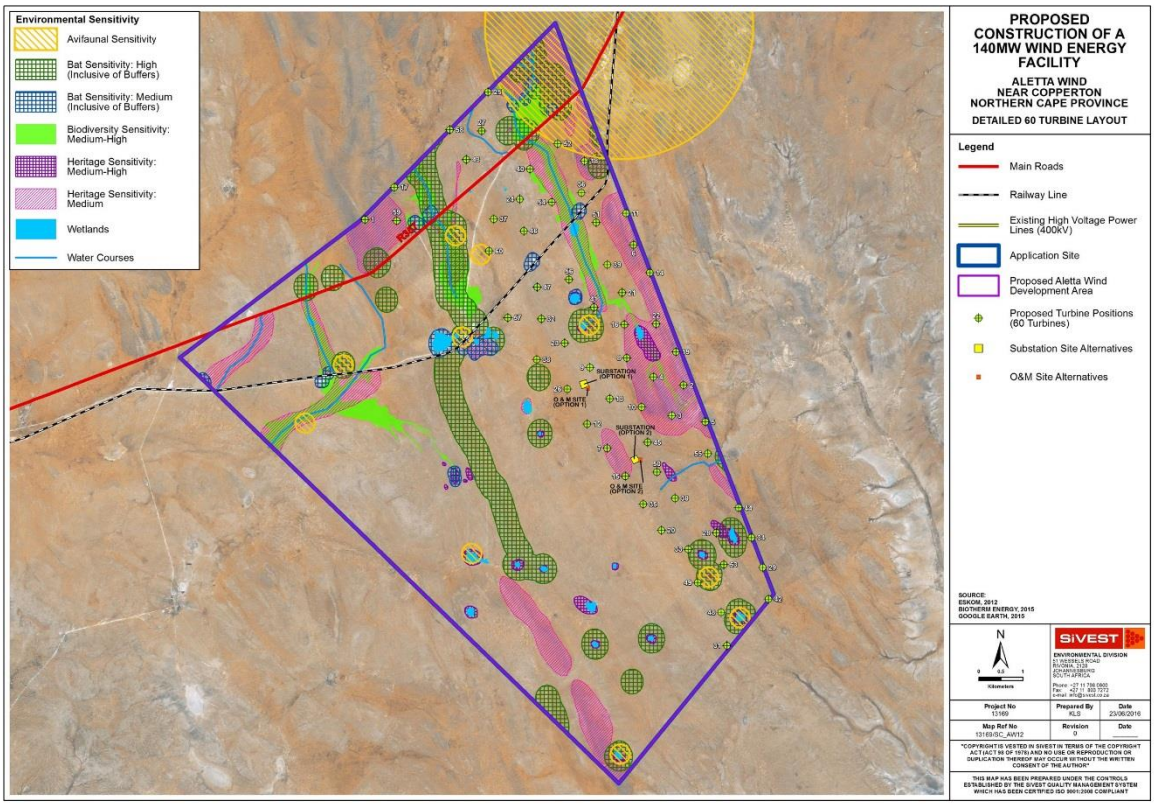


Figure 47: Proposed Layout Alternatives in relation to the Sensitive Areas

11.9 Recommendations

It is recommended that the specialist studies pertaining to certain aspects be carried forward into the EIA Phase, namely, those studies mentioned above. Various issues and concerns have been identified which require detailed assessment and thus it is recommended that the EIA phase be allowed to continue in order to assess these and the impacts associated.

11.10 Public Participation

The Public Participation during the EIA Phase will involve the following:

Table 95: Public Participation activities still to take place.

ACTIVITY	FUNCTION
Prepare and distribute EIA newsletter	Notify registered I&APs of outcome of the Scoping Phase (including timeframes and when their input is required).

ACTIVITY	FUNCTION
Focus Group Meeting	Meeting to provide feedback on the findings of the detailed specialist studies to key stakeholders (specifically the Local and District Municipalities and Landowners)
Public Meetings	Provide feedback on the findings of the detailed specialist studies to the general public.
Public comment period	Notification of I&APs of the availability of the DEIAr report for public comment.
Notification of granting or refusal of Environmental Authorisation	Informing of all registered I&APs of the EA
Environmental Authorisation appeal period	Receive any appeals and forward to DEA

11.11 Proposed Project Schedule going forward

The table below represents the proposed schedule of events for the project till closure upon DEA's decision.

Table 96: Proposed Project Schedule

	June 2016	August 2016	September 2016	October 2016	November 2016	March 2017
Start of DSR Comment period	Dates to be confirmed in the impact phase					
Submission of FSR to DEA		Dates to be confirmed in the impact phase				
DEA Decision on FSR			Dates to be confirmed in the impact phase			
Distribution of EIA Newsletter			Dates to be confirmed in the impact phase			
DEIAr Comment period			Dates to be confirmed in the impact phase			
Hold Meetings (FGMs and PM)				Dates to be confirmed in the impact phase		
Submission of FEIAr to DEA					Dates to be confirmed in the impact phase	
DEA Decision						Dates to be confirmed in the impact phase

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