ENVIRONMENTAL IMPACT ASSESSMENT PROCESS
FINAL EIA REPORT

PROPOSED RIVERBANK WIND ENERGY FACILITY
EASTERN CAPE PROVINCE

(DEA REF No: 12/12/20/1836)

FINAL FOR SUBMISSION TO DEA
MARCH 2011

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PROJECT DETAILS

DEA Reference No.	:	12/12/20/1836
Title	:	Environmental Impact Assessment Process Final Environmental Impact Assessment Report: Proposed Riverbank Wind Energy Facility and associated infrastructure on a site near Wesley, Eastern Cape
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EXECUTIVE SUMMARY

Just Energy (Pty) Ltd, an Independent Power Producer, proposes to establish a commercial wind energy facility to generate electricity on a site near Wesley, to be referred to as the Riverbank Wind Energy Facility. The site that has been identified for the establishment of the facility is located approximately 4 km north-east of Wesley in the Eastern Cape, within the Ngqushwa Local Municipality.

Just Energy proposes to uplift and support this local community through a rental agreement and a cooperative agreement. Landowners will be awarded a rental income for the land where wind turbines will be located. Just Energy has proposed collaborating with the Uncedo Lwethu Farmers Cooperative to establish a cooperative agreement where the funds from an equity shareholding can be managed and operated by the members of the community themselves. This shareholding will yield dividends, which can be applied to a range of social and economic development activities e.g. investments in local enterprise development, health care, education, and energy efficient housing. The agreement, working with service providers such as experienced micro-finance institutes will then implement a programme of investing in the community. Parameters will be laid down within the trust deeds that ensure that the overall social purpose of the funds cannot be changed, and which set out the social sectors to which the funds can be applied.

The proposed facility will be located on Sandflat 149; Riverbank 147; Holstein 148; Porcupine Kop 169; Bristol 170. The development site covers an extent of approximately 20 km^2 on which up to 22 wind turbine generators are proposed with a maximum generating capacity of 66 MW in a phased approach. The following associated infrastructure will be required for the establishment of the facility:

- 22 wind turbines with a hub height of up to 90 m each, to be secured using concrete foundations.
- On-site substation(s) to facilitate the connection between the facility and the grid via the Wesley Substation.
- The wind turbines will be connected to each other and to the on-site substation(s) via electrical transformers at the base of each turbine and using 22 kV medium voltage cables, buried approximately 1 m below ground.
- New overhead power line(s) to connect to Eskom's existing Wesley Substation which is located approximately 5 km west of the project site.
- Internal access roads to each turbine.
- Ancillary infrastructure including a control room; workshop; high voltage switchgear room; mess

room; ablution facilities; and a storeroom.

An area of less than 0.4 km^2 is anticipated to be disturbed to some extent during the construction of the wind energy facility. This amounts to less than 2% of the total area which will form part of the total facility.

The nature and extent of this facility, as well as potential environmental impacts associated with the construction and operation of a facility of this nature are explored in more detail in this EIA Report which consists of the following chapters:

Chapter 1: Provides background to the proposed project and the EIA process.
Chapter 2: Provides an overview of the proposed project.
Chapter 3: Provides an overview of the regulatory and legal context for electricity generation projects
Chapter 4: Outlines the process which was followed during the EIA Phase, including the consultation program that was undertaken and input received from interested parties and stakeholders.
Chapter 5: Describes the existing biophysical and socio-economic environment.
Chapter 6: Presents the assessment of environmental impacts associated with the facility, its associated infrastructure.
Chapter 7: Presents the conclusions of the EIA process, as well as an impact statement on the proposed project.
Chapter 8: Provides a list of references and information sources used in undertaking the studies for this EIA Report.

The Scoping Phase of the EIA process identified potential issues associated with the proposed project, and defined the extent of the studies required within the EIA Phase. The Scoping Phase also identified potentially sensitive areas within the study site which served to inform the placement of the wind turbines through a funnel-down approach.

The EIA Phase addressed those identified potential environmental impacts and benefits (direct, indirect, and cumulative impacts) associated with all phases of the project including design, construction, and operation. The EIA Phase recommends appropriate mitigation measures for potentially significant environmental impacts.

The EIA Report aims to provide sufficient information regarding the potential impacts and the acceptability of these impacts in order for the Competent Authority (i.e. the National Department of Environmental Affairs (DEA)) to make an informed decision regarding the proposed project.

The release of a Draft EIA Report provided stakeholders with an opportunity to verify that the issues they have raised through the EIA process have been captured and adequately considered. This Final

EIA Report incorporates all the issues and responses raised during the public review of the draft EIA Report.

The conclusions and recommendations of this Final EIA Report are the result of the assessment of identified impacts by specialists, and the parallel process of public participation. The public consultation process has been extensive and every effort has been made to include representatives of all stakeholders in the study area.

The most significant environmental impacts associated with the proposed project, as identified through the EIA, include:

» Visual impacts on the natural scenic resources of the study area and/or region imposed by the components of the facility (i.e. particularly through the visual exposure of the prominent wind turbine structures).
» Local site-specific impacts as a result of physical disturbance/modification to the site with the establishment of the facility and associated power line infrastructure.
» Impacts on the social environment (i.e. these will manifest as both positive and negative impacts).

One of the drivers behind the proposed facility is the upliftment of the Wesley community. The Riverbank Wind Energy Facility will benefit this community during and beyond the facility's operational lifespan. Given the generally low to moderate significance of the potential negative impacts, as well as the potential for impact mitigation, the positive social benefits outweigh the negative social and biophysical impacts.

The findings of the specialist studies conclude that there are **no environmental fatal flaws** that should prevent the proposed project from proceeding, provided that the recommended mitigation and management measures are implemented. The significance levels of the majority of identified negative impacts can generally be reduced by implementing the recommended mitigation measures. With reference to the information available at this planning approval stage in the project cycle, the **confidence** in the environmental assessment undertaken is regarded as **acceptable**.

TABLE OF CONTENTS

APPENDICES

ABBREVIATIONS AND ACRONYMS

BID	Background Information Document
CBOs	Community Based Organisations
CDM	Clean Development Mechanism
CO_2	Carbon dioxide
D	Diameter of the rotor blades
DEDEA	Department of Economic Development and Environmental Affairs
DEA	National Department of Environmental Affairs
DOE	Department of Energy
DOT	Department of Transport
DWA	Department of Water Affairs
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
FIT	Feed-in Tariffs
GIS	Geographical Information Systems
GG	Government Gazette
GN	Government Notice
GWh	Giga Watt Hour
I&AP	Interested and Affected Party
IDP	Integrated Development Plan
km^2	Square kilometres
km/hr	Kilometres per hour
kV	Kilovolt
m^2	Square meters
m/s	Meters per second
MW	Mega Watt
NEMA	National Environmental Management Act (Act No. 107 of 1998)
NERSA	National Energy Regulator of South Africa
NHRA	National Heritage Resources Act (Act No. 25 of 1999)
NGOs	Non-Governmental Organisations
NIRP	National Integrated Resource Planning
NWA	National Water Act (Act No. 36 of 1998)
REFIT	Renewable Energy Feed-in Tariff
SAHRA	South African Heritage Resources Agency
SANBI	South African National Biodiversity Institute
SANRAL	South African National Roads Agency Limited
SDF	Spatial Development Framework

DEFINITIONS AND TERMINOLOGY

Alternatives: Alternatives are different means of meeting the general purpose and need of a proposed activity. Alternatives may include location or site alternatives, activity alternatives, process, or technology alternatives, temporal alternatives or the 'do nothing' alternative.

Ambient sound level: The reading on an integrating impulse sound level meter taken at a measuring point in the absence of any alleged disturbing noise at the end of a total period of at least 10 minutes after such meter was put into operation.

Betz limit: It is the flow of air over the blades and through the rotor area that makes a wind turbine function. The wind turbine extracts energy by slowing the wind down. The theoretical maximum amount of energy in the wind that can be collected by a wind turbines' rotor is approximately 59%. This value is known as the Betz Limit

Cumulative impacts: Impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities (e.g. discharges of nutrients and heated water to a river that combine to cause algal bloom and subsequent loss of dissolved oxygen that is greater than the additive impacts of each pollutant). Cumulative impacts can occur from the collective impacts of individual minor actions over a period and can include both direct and indirect impacts.

Cut-in speed: The minimum wind speed at which the wind turbine will generate usable power.

Cut-out speed: The wind speed at which shut down occurs.

Direct impacts: Impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity (e.g. noise generated by blasting operations on the site of the activity). These impacts are usually associated with the construction, operation or maintenance of an activity and are generally obvious and quantifiable

Disturbing noise: A noise level that exceeds the ambient sound level measured continuously at the same measuring point by 7 dB or more.

'Do nothing' alternative: The 'do nothing' alternative is the option of not undertaking the proposed activity or any of its alternatives. The 'do nothing' alternative also provides the baseline against which the impacts of other alternatives should be compared.

Endangered species: Taxa in danger of extinction and whose survival is unlikely if the causal factors continue operating. Included here are taxa whose numbers of individuals have been reduced to a critical level or whose habitats have been so drastically reduced that they are deemed to be in immediate danger of extinction.

Endemic: An "endemic" is a species that grows in a particular area (is endemic to that region) and has a restricted distribution. It is only found in a particular place. Whether something is endemic or not depends on the geographical boundaries of the area in question and the area can be defined at different scales.

Environment: the surroundings within which humans exist and that are made up of:

i. The land, water and atmosphere of the earth;
ii. Micro-organisms, plant and animal life;
iii. Any part or combination of (i) and (ii) and the interrelationships among and between them; and
iv. The physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being.

Environmental impact: An action or series of actions that have an effect on the environment.

Environmental impact assessment: Environmental Impact Assessment (EIA), as defined in the NEMA EIA Regulations and 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 that application.

Environmental management: Ensuring that environmental concerns are included in all stages of development, so that development is sustainable and does not exceed the carrying capacity of the environment.

Environmental management plan: An operational plan that organises and co-ordinates mitigation, rehabilitation and monitoring measures in order to guide the implementation of a proposal and its ongoing maintenance after implementation.

Generator: The generator is what converts the turning motion of wind turbines blades into electricity

Indigenous: All biological organisms that occurred naturally within the study area prior to 1800

Indirect impacts: Indirect or induced changes that may occur because of the activity (e.g. the reduction of water in a stream that supply water to a reservoir that supply

water to the activity). These types of impacts include all the potential impacts that do not manifest immediately when the activity is undertaken or which occur at a different place because of the activity.

Interested and affected party: Individuals or groups concerned with or affected by an activity and its consequences. These include the authorities, local communities, investors, work force, consumers, environmental interest groups, and the public.

Nacelle: The nacelle contains the generator, control equipment, gearbox, and anemometer for monitoring the wind speed and direction.

Rare species: Taxa with small world populations that are not at present Endangered or Vulnerable, but are at risk as some unexpected threat could easily cause a critical decline. These taxa are usually localised within restricted geographical areas or habitats or are thinly scattered over a more extensive range. This category was termed Critically Rare by Hall and Veldhuis (1985) to distinguish it from the more generally used word "rare."

Red data species: Species listed in terms of the International Union for Conservation of Nature and Natural Resources (IUCN) Red List of Threatened Species, and/or in terms of the South African Red Data list. In terms of the South African Red Data list, species are classified as being extinct, endangered, vulnerable, rare, indeterminate, insufficiently known or not threatened (see other definitions within this glossary).

Rotor: The portion of the wind turbine that collects energy from the wind is called the rotor. The rotor converts the energy in the wind into rotational energy to turn the generator. The rotor has three blades that rotate at a constant speed of about 15 to 28 revolutions per minute (rpm).

Significant impact: An impact that by its magnitude, duration, intensity, or probability of occurrence may have a notable effect on one or more aspects of the environment.

Tower: The tower, which supports the rotor, is constructed from tubular steel and can be up to 90 m tall. The nacelle and the rotor are attached to the top of the tower. The tower on which a wind turbine is mounted is not just a support structure. It also raises the wind turbine so that its blades safely clear the ground and so it can reach the stronger winds at higher elevations. Larger wind turbines are usually mounted on towers ranging from 40 to 90 m tall. The tower must be strong enough to support the wind turbine and to sustain vibration, wind loading and the overall weather elements for the lifetime of the wind turbine.

Wind power: A measure of the energy available in the wind.

Wind rose: The term given to the diagrammatic representation of joint wind speed and direction distribution at a particular location. The length of time that the wind comes from a particular sector is shown by the length of the spoke, and the speed is shown by the thickness of the spoke.

Wind speed: The rate at which air flows past a point above the earth's surface.

INTRODUCTION CHAPTER 1

Just Energy in association with the Uncedo Lwethu Farmers Cooperative and Oxfam Great Britain propose the establishment of a community based wind energy facility and associated infrastructure which will be referred to as the **Riverbank Wind Energy Facility**. The purpose of the facility is to generate electricity from a renewable energy resource (i.e. wind) to provide power to the national electricity grid. The proposed facility will benefit the local community through the generation of rental income for the properties on which the facility will be located, as well as through an equity share in the facility during the operational phase. The identified site is located approximately 4 km north east of Wesley in the Eastern Cape, within the Ngqushwa Local Municipality (refer to Figure 1.1).

The development site covers an extent of approximately 20 km^2 on which up to 22 wind turbine generators are proposed with a **maximum generating capacity of 66 MW** in a phased approach. The following associated infrastructure will be required for the establishment of the facility:

- **22 wind turbines** with a hub height of up to 90 m each, to be secured using concrete foundations (20 m (l) x 20 m (w) x 2 m (d)) to support them.
- On-site **substation(s)** to facilitate the connection between the facility and the grid via the Wesley Substation (the generated power will be stepped up from 22 kV to 66 kV via a transformer). The size of the substation will be dependent on the option selected.
- The wind turbines will be connected to each other and to the onsite substation(s) via electrical transformers at the base of each turbine and using 22 kV medium voltage **cables**, buried approximately 1 m below ground. The underground cables will be routed to follow the existing and proposed internal access roads as far as possible.
- New overhead **power line(s)** to connect to Eskom's existing Wesley Substation which is located approximately 5 km west of the project site.
- **Internal access roads** to each turbine.
- Ancillary infrastructure including a control room; workshop; high voltage switchgear room; mess room; ablution facilities; a SCADA[1] room; and a storeroom

[1] Supervisory control and data acquisition, it generally refers to industrial control systems: computer systems that monitor and control industrial, infrastructure, or facility-based processes

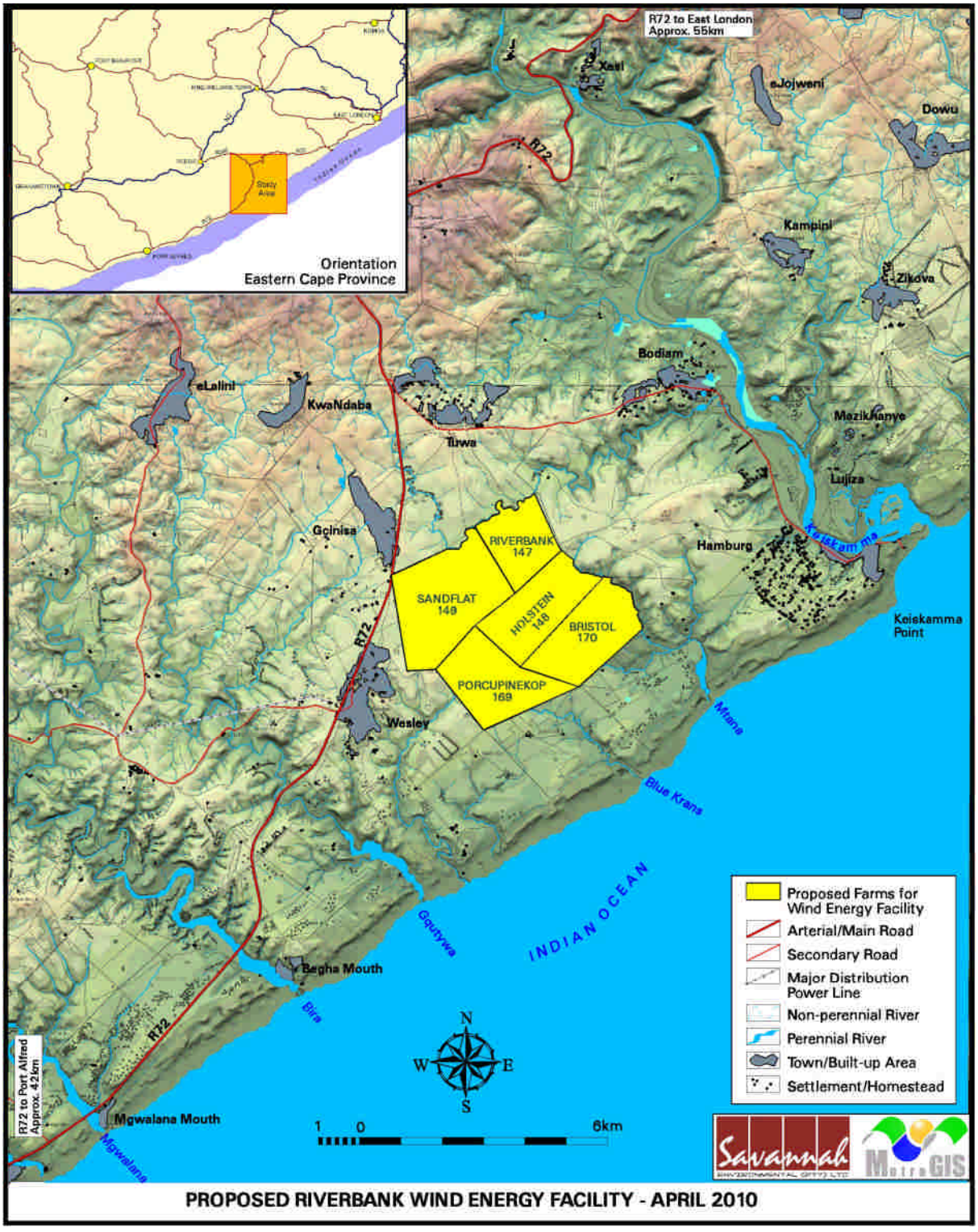


Figure 1.1: The location of the proposed development site for the Riverbank Wind Energy Facility

1.1 Requirement for an EIA Process

The proposed development is subject to the requirements of the Environmental Impact Assessment (EIA) Regulations, published in terms of Section 24(5) of the National Environmental Management Act (NEMA, Act No. 107 of 1998). NEMA is the national legislation that provides for the authorisation of certain controlled activities known as "listed activities." In terms of Section 24(1) of NEMA, the potential impact on the environment associated with these listed activities must be considered, investigated, assessed and reported on to the competent authority (the decision-maker) charged by NEMA with granting of the relevant environmental authorisation. As this is a proposed electricity generation project, which is considered of national importance, the National Department of Environmental Affairs (DEA) is the competent authority for this project. An application for authorisation has been accepted by DEA under application reference number **12/12/20/1836**. Through the decision-making process, DEA will be supported by the Eastern Cape Department of Economic Development and Environmental Affairs (DEDEA), the provincial commenting authority for the project.

The need to comply with the requirements of the EIA Regulations ensures that decision-makers are provided the opportunity to consider the potential environmental impacts of a project early in the project development process, and assess if environmental impacts can be avoided, minimised or mitigated to acceptable levels. Comprehensive, independent environmental studies are required to be undertaken in accordance with the EIA Regulations to provide the competent authority with sufficient information in order for an informed decision to be taken regarding the project. Just Energy appointed Savannah Environmental (Pty) Ltd to conduct the independent EIA process for the proposed project.

In terms of sections 24 and 24D of NEMA, as read with Government Notices R385 (Regulations 27 – 36) and R387, a Scoping and EIA are required to be undertaken for this proposed project as it includes the following activities listed in terms of GN R386 and R387 (GG No 28753 of 21 April 2006):

Relevant Notice	Activity No	Description of listed activity
Government Notice R387 (21 April 2006)	*1(a)*	The construction of facilities or infrastructure, including associated structures or infrastructure, for the generation of electricity where (i) the electricity output is 20 megawatts or more; or (ii) the elements of the facility cover a combined area in excess of 1 hectare.
Government Notice R387 (21 April 2006)	*1(l)*	The construction of facilities or infrastructure, including associated structures or infrastructure, for the transmission and distribution of above ground electricity with a capacity of 120 kV or more.

Government Notice R387 (21 April 2006)	*2*	Any development, activity, including associated structures and infrastructure, where the total area of the developed area is, or is intended to be 20 ha or more.
Government Notice R386 (21 April 2006)	*1(m)*	Any purpose in the one in ten year flood line of a river or stream, or within 32 metres from the bank of a river or stream where the flood line is unknown, excluding purposes associated with existing residential use, but including (i) canals; (ii) channels; (iii) bridges; (iv) dams; and (v) weirs.
Government Notice R386 (21 April 2006)	*7*	The above ground storage of a dangerous good, including petrol, diesel, liquid petroleum gas or paraffin, in containers with a combined capacity of more than 30 cubic metres but less than 1 000 cubic metres at any one location or site.
Government Notice R386 (21 April 2006)	*12*	The transformation or removal of indigenous vegetation of 3 hectares or more or of any size where the transformation or removal would occur within a critically endangered or an endangered ecosystem listed in terms of section 52 of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004).
Government Notice R386 (21 April 2006)	*14*	The construction of masts of any material of type and of any height, including those used for telecommunications broadcasting and radio transmission, but excluding (a) masts of 15m and lower exclusively used by (i) radio amateurs; or (ii) for lightening purposes (b) flagpoles; and (c) lightening conductor poles.
Government Notice R386 (21 April 2006)	*15*	The construction of a road that is wider than 4 m or that has a reserve wider than 6 m, excluding roads that fall within the ambit of another listed activity or which are access roads of less than 30 m long.
Government Notice R386 (21 April 2006)	*16(b)*	The transformation of undeveloped, vacant, or derelict land to residential mixed, retail, commercial, industrial, or institutional use where such development does not constitute infill and where the total area to be transformed is bigger than 1 hectare.

Note that this EIA is being conducted in accordance EIA Regulations that were current at the time of submitting the Application for Authorisation (i.e. the EIA Regulations of April 2006). No additional listed activities in terms of the EIA Regulations promulgated in August 2010 are triggered by the proposed wind energy facility development. Therefore, no additional activities are required to be considered within this application.

1.2 Objectives of the EIA Process

The Scoping Phase of the EIA process, which preceded this current EIA Phase, **identified** a range of potential issues associated with the proposed project. The Scoping Phase also defined the extent of the studies required within this EIA Phase. This was achieved through an evaluation of the proposed project, involving the project proponent, specialists with experience in EIAs for similar projects, and a public consultation process with key stakeholders that included both government authorities and interested and affected parties (I&APs). The Scoping Phase was completed in August 2010 with the acceptance of the Final Scoping Report and Plan of Study for the EIA Phase by DEA.

The EIA Phase **assesses** those identified potential environmental impacts and benefits (direct, indirect, and cumulative impacts) associated with all phases of the project including design, construction, operation, and decommissioning, and recommends appropriate mitigation measures for potentially significant environmental impacts. The EIA phase aims to provide the environmental authorities with sufficient information to make an informed decision regarding the proposed project.

The release of a Draft EIA Report for public review provided stakeholders with an opportunity to verify that the issues they have raised through the EIA process to date have been captured and adequately considered. This review period also provided further opportunity for additional key issues for consideration to be raised. Following the 30 day review period, this Final EIA Report will be submitted to DEA for review and acceptance. This final report incorporate all issues and responses raised during the public review period as part of a Comments and Response Report.

1.3 Structure of this EIA Report

The EIA Report consists of eight chapters, which include:

Chapter 1: Provides background to the proposed facility and the environmental impact assessment.

Chapter 2: Provides an overview of the proposed project.

Chapter 3: Provides an overview of the regulatory and legal context for electricity generation projects and the EIA process.

Chapter 4: Outlines the process which was followed during the EIA Phase, including the consultation program that was undertaken and input received from interested parties.

Chapter 5: Describes the existing biophysical and socio-economic environment.

Chapter 6: Presents the assessment of environmental impacts associated with the proposed facility and associated power line alternatives.

Chapter 7: Presents the conclusions of as well as an impact statement on the proposed project.

Chapter 8: Provides a list of references and information sources used in undertaking the studies for this EIA Report.

1.4 The Environmental Assessment Practitioner

Savannah Environmental was contracted as the independent **Environmental Assessment Practitioner** (EAP) to undertake the EIA process for the proposed project. Neither Savannah Environmental nor any of its specialist sub-consultants on this project are subsidiaries of or are affiliated to Just Energy in any way. Furthermore, Savannah Environmental does not have any interests in secondary developments that could arise out of the authorisation of the proposed project.

Savannah Environmental is a specialist environmental consulting company providing holistic environmental management services, including environmental impact assessments and planning to ensure compliance and evaluate the risk of development, and the development and implementation of environmental management tools. Savannah Environmental benefits from the pooled resources, diverse skills and experience in the environmental field held by its team.

The Savannah Environmental team have considerable experience in environmental impact assessments and environmental management, and have been actively involved in undertaking environmental studies, for a wide variety of projects throughout South Africa, including those associated with electricity generation. They have successfully managed and undertaken EIA processes for a number wind and solar energy facilities, throughout South Africa.

In order to adequately identify and assess potential environmental impacts associated with the proposed project, Savannah Environmental has appointed the following specialist sub-consultants to conduct specialist impact assessments. Refer to Appendix A for the curricula vitae for Savannah Environmental and the specialist sub-consultants.

» Ecology, flora and fauna – David Hoare Consulting
» Avifauna – Avisense Consulting
» Geology, soils, and erosion potential – Outeniqua Geotechnical Services
» Heritage resources – Albany Museum
» Palaeontology – Albany Museum
» Noise – MENCO
» Visual – MetroGIS
» Social – Tony Barbour Environmental Consulting and Research

OVERVIEW OF THE PROPOSED PROJECT CHAPTER 2

The previous chapter introduced the proposed project, the legal requirements for the undertaking of an EIA process as per NEMA, and the environmental team assigned to the task. This chapter explores the following:

» The need and desirability of a project of this nature within the local, regional, and national context.
» A consideration of project options as well as the "do nothing" alternative; site specific layout options; and alignments for the power line(s) to the Wesley Substation located approximately 5 km west of the project site.
» A technical description of wind energy as a power generation technology.
» The scope of works for the proposed facility during the construction, operation, and decommissioning phases.

2.1. The Purpose of the Proposed Project

The primary purpose of the proposed facility is the upliftment of the local community on whose land the proposed facility will be constructed; this will materialise in two ways.

1. Landowners will be awarded a rental income for the land where wind turbines will be located.
2. Through their role in project development, particularly in the area of building social and political acceptance for the project, the community will gain shareholding in the developed project via a Cooperative Agreement. This shareholding, yields dividends, which can be applied to a range of social and economic development activities e.g. investments in local enterprise development, health care, education, and energy efficient housing.

2.1.1 The Local Community

The Wesley community which has been targeted by Just Energy falls within the Ngqushwa Local Municipality which is predominantly rural (i.e. 95% of the population lives in the rural areas). Employment rates are low and poverty levels are high which impacts negatively on the municipality's ability to generate income from services charges and rates. According to the municipality's Integrated Development Plan, the economic base is narrow and there is a need to diversify and broaden the economy by creating employment opportunities and developing an environment conducive to economic growth. One of the priority development issues is that of infrastructure development including affordable access to electricity.

Just Energy proposed collaborating with the Uncedo Lwethu Farmers Cooperative to establish a cooperative agreement so that the funds from the equity shareholding can be managed and operated by the members of the community themselves. The trust, working with service providers such as experienced micro-finance institutes will then implement a programme of investing in the community. Parameters will be laid down within the trust deeds that ensure that the overall social purpose of the funds cannot be changed, and which set out the social sectors to which the funds can be applied. Just Energy will work with the community to determine the social sectors that the funds will be used for, which may include sectors such as:

» Investing in small and medium sized businesses within the community and in the start up of new enterprises;
» Upgrading of low income housing, particularly with energy efficient measures, such as energy efficient stoves and insulation;
» Supporting health care in the community;
» Supporting education at all levels in the community;
» Supporting training and skills building within the community; and
» Supporting local socially focused community benefit organisations.

2.1.2 Renewable Generation Targets

The secondary purpose of the proposed facility is to sell the power generated to generate funds for the community and to add new capacity to the national electricity grid. This will aid in achieving the goal of a 30% share of all new power generation being derived from IPPs, as targeted by the Department of Energy (DoE).

To contribute towards this target and towards socio-economic and environmentally sustainable growth, and kick start and stimulate the renewable energy industry in South Africa, the need to establish an appropriate market mechanism was identified, and Feed-in Tariffs (FIT) have been set. FITs are, in essence, guaranteed prices for electricity supply rather than conventional consumer tariffs. The basic economic principle underpinning the FITs is the establishment of a tariff (price) that covers the cost of generation plus a "reasonable profit" to induce developers to invest. This is quite similar to the concept of cost recovery used in utility rate regulation based on the costs of capital. Feed-in tariffs to promote renewable energy have now been adopted in over 36 countries around the world. The establishment of the Renewable Energy Feed-In Tariff (REFIT) in South Africa provides the opportunity for an increased contribution towards the sustained growth of the renewable energy sector in the country, the region and internationally, and promote competitiveness for renewable energy with conventional energies in the medium- and long-term. Under the National Energy Regulator Act, 2004 (Act No 40 of 2004), the Electricity Regulation Act, 2006 (Act No 4 of 2006) and all subsequent relevant Acts of Amendment, the National Energy Regulator of South Africa

(NERSA) has the mandate to determine the prices at and conditions under which electricity may be supplied by licence.

2.2. Description of the Proposed Wind Energy Facility

The facility is proposed to accommodate up to **22 wind turbines**, to make use of the wind resource on the site. The facility is proposed to have a **first phase** development of 10 turbines and a potential **second phase** development of 12 turbines. The full potential of the wind energy facility planned for the larger site (i.e. both phases which will have a total installed capacity of 66 MW) has been assessed through this EIA Report.

Each turbine would have a generating capacity of 3 MW and would need to be appropriately spaced within the site. An area of approximately 20 km^2 in extent is being investigated within the EIA process within which the facility is proposed (refer to Figure 1.1). The phasing of the facility across the broader site is proposed with Phase 1 proposed on Sandflat 149, Riverbank 147; and Phase 2 proposed on Porcupine Kop 169, Holstein 148 (with exclusions), and Bristol 170.

The following associated infrastructure is proposed over the two phases:

» **22 wind turbines** with a hub height of up to 90 m each, to be secured using concrete foundations (20 m (l) x 20 m (w) x 2 m (d)) to support them.
» On-site **substation(s)** to facilitate the connection between the facility and the grid via the Wesley Substation (the generated power will be stepped up from 22 kV to 66 kV via a transformer). The size of the substation will be dependent on the option selected (refer to Section 2.3.2 of this chapter).
» The wind turbines will be connected to each other and to the onsite substation(s) via electrical transformers at the base of each turbine and using 22 kV medium voltage **cables**, buried approximately 1 m below ground. The underground cables will be routed to follow the existing and proposed internal access roads as far as possible.
» New overhead **power line(s)** to connect to Eskom's existing Wesley Substation which is located approximately 5 km west of the project site (refer to section 2.3.3 of this chapter).
» **Internal access roads** to each turbine.
» Ancillary infrastructure including a control room; workshop; high voltage switchgear room; mess room; ablution facilities; a SCADA[2] room; and a storeroom.

[2] Supervisory control and data acquisition, it generally refers to industrial control systems: computer systems that monitor and control industrial, infrastructure, or facility-based processes.

2.3 Project Alternatives

In accordance with the requirements of the EIA Regulations, project alternatives have been considered within the EIA process and are detailed below.

2.3.1 Site alternatives

No site alternatives are proposed for this project as the placement of a facility of this nature is strongly dependent on several site specific factors including:

The wind resource - the estimated average wind speed for the site is 8.2 m/s at a hub height of up to 90 m. The average of 8.2m/s is considered high and therefore excellent for wind energy generation.

Beneficial to the Wesley community - the community on whose land the proposed facility would be sited will be direct beneficiaries through a rental agreement with Just Energy.

Extent of the site - the proposed site covers an area of approximately 20 km^2 which will allow for the installation of the entire facility while avoiding the occupants of the land, thereby allowing coexistence with the facility.

Power evacuation - the power generated can be evacuated into the Eskom national grid via the Wesley Substation which is located approximately 5 km west of the site.

Site topography - the proposed site will allow for the avoidance of shielding of the wind resource as it is situated at a high point within an undulating series of hills.

Site access - the site can be accessed via the R72 national road that links East London and Port Elizabeth. The site is therefore well-connected to the major routes in this region, which will assist in the transportation of the turbine components to the site, either from the Port Elizabeth, East London, or Coega harbours. The existing "internal" access road, (sign posted as DR 07491, Sandfla) is currently a gravel road and is proposed to remain the point of access to the site off the R72.

As per these characteristics, the site is regarded by Just Energy as being highly desirable for a wind energy facility.

2.3.2 Layout design alternatives

Layout design alternatives are possible due to the broader extent of the site. The placement of the 22 wind turbines (i.e. both phases) and associated infrastructure within

the 20 km^2 site will allow Just Energy to avoid any areas of sensitivity, including but not limited to potential noise receptors.

Although an indicative layout is available, exact turbine positions will only be finalised in response to monitored wind data from the wind monitoring mast on the proposed site.

In order to transfer the power generated at the facility site to the Eskom grid, overhead distribution power line(s) will connect between the on-site substation(s) to Eskom's Wesley Substation located approximately 5 km west of the site. At this stage the following grid connection configuration options are being considered:

» ***Configuration option A: 66 kV connections:*** - this option is based on stepping up the voltage level from the 22 kV on-site substation to 66 kV for transmission and connection at the Wesley Substation.
» ***Configuration option b: 22 kV connections:*** - this option looks at transmitting the generated power at the substation voltage level of 22 kV from the facility to the Wesley Substation.

The Eastern Cape division of Eskom has indicated that since the existing 22 kV overhead lines in the area are *single wooden pole* types, that this would be an appropriate solution for connecting the facility to the Wesley Substation. Four scenarios are possible for the configuration of electrical substations and associated compounds, as follows:

Option	Grid Connection Voltage	Sub-station Configuration	Capacity	Footprint Size
A	66 kV	1 substation, sized to serve Phase 1 + 2, located centrally within complete site. Compounds sized to accommodate: *Collector bus-bars, boards and meters* *22/66kV Step-up transformers*	80 MVA	120 m x 70 m
B	22 kV	1 substation sized to serve Phase 1 + 2. Compounds sized to accommodate: *Collector bus-bars, boards and meters (Step-up transformers all located in Wesley Substation)*	80 MVA	50 m x 30 m
C	66 kV	2 individual substations, sized to serve Phases 1 and 2 respectively, each located centrally within associated phases. Compounds sized to accommodate: *Collector bus-bars, boards and meters* *22/66kV Step-up transformers*	Phase 1: 40 MVA Phase 2: 40 MVA	80 m x 70 m (each)

D	22kV	2 individual substations, sized to serve Phases 1 and 2 respectively, each located centrally within associated phases. Compounds sized to accommodate: *Collector bus-bars, boards and meters (Step-up transformers all located in Wesley Substation)*	Phase 1: 40 MVA Phase 2: 40 MVA	40 m x 30 m (each)

Final sizes and location of the facility substation/s will be subject to Eskom's final grid connection requirements, permitted power line configurations and final micro-siting of the wind turbines. An indicative concept design layouts present four options for overhead power lines routes. The route options are independent of the final grid connection voltage. The options are summarised below (refer to Figures 2.1 – 2.4):

Option	Sub-station Configuration	Overhead Power Line Route
1	1 substation, sized to serve Phase 1 + 2.	Single corridor follows line of existing road through Sandflat 149 to meet and then run alongside existing 22kV power line on R72, up to point of connection at Wesley substation.
2	1 substation sized to serve Phase 1 + 2.	Single corridor traverses Sandflat 149 to meet and then run alongside existing 22kV power line within Sandflat 149, up to point of connection at Wesley substation.
3	2 individual substations, sized to serve Phases 1 and 2 respectively, each located centrally within associated phases.	Two corridors serving each phase. Phase 1 corridor follows line of existing road through Sandflat 149 to meet and then run alongside existing 22kV power line on R72, up to point of connection at Wesley substation. Phase 2 corridor traverses Sandflat 149 to meet and then run alongside existing 22kV power line within Sandflat 149, up to point of connection at Wesley substation.
4	2 individual substations, sized to serve Phases 1 and 2 respectively, each located centrally within associated phases.	Corridors as per Option 3, with the exception of a shorter corridor run within Sandflat 149 for Phase 1.

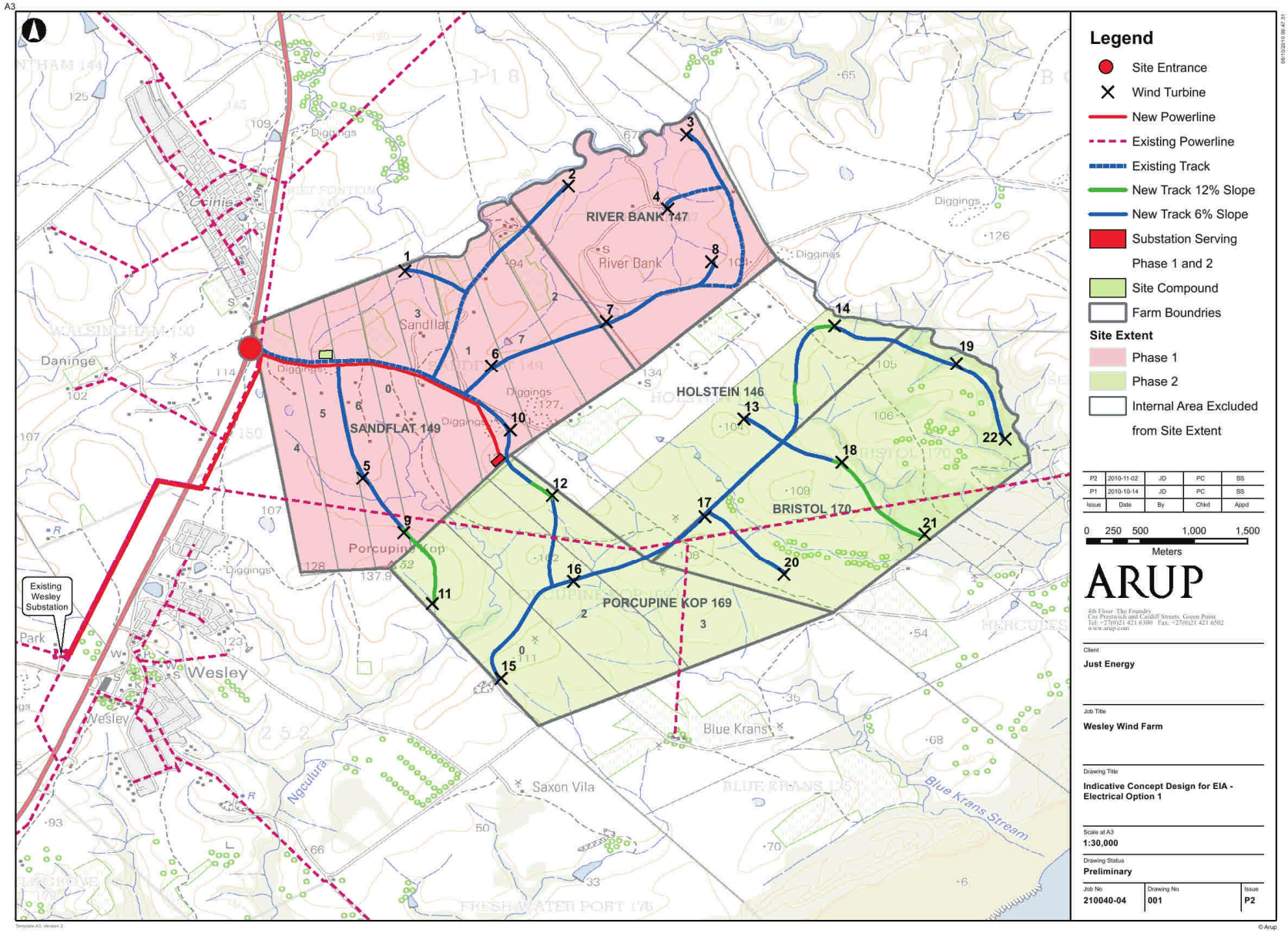


Figure 2.1: Layout option number 1

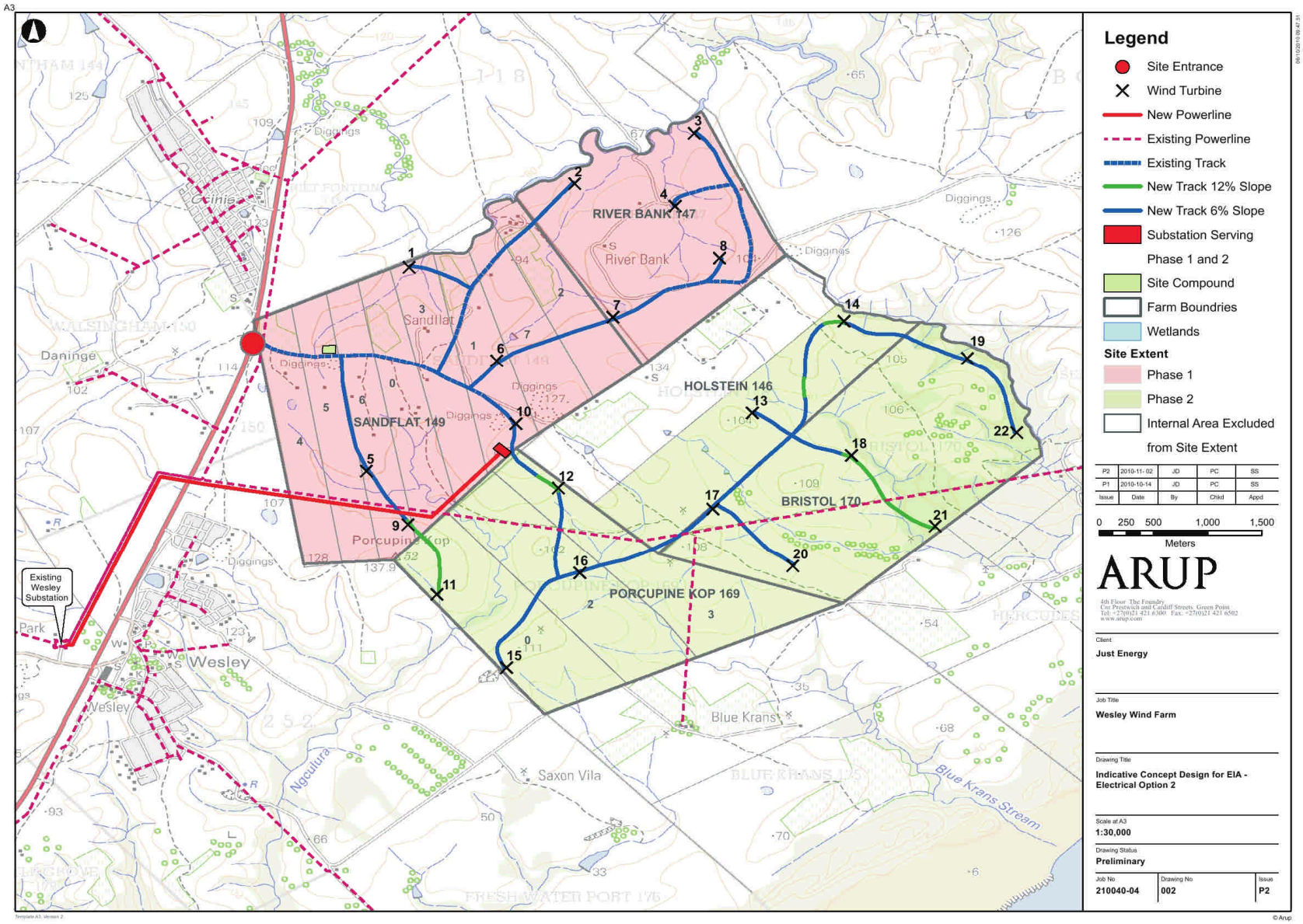


Figure 2.2: Layout option number 2

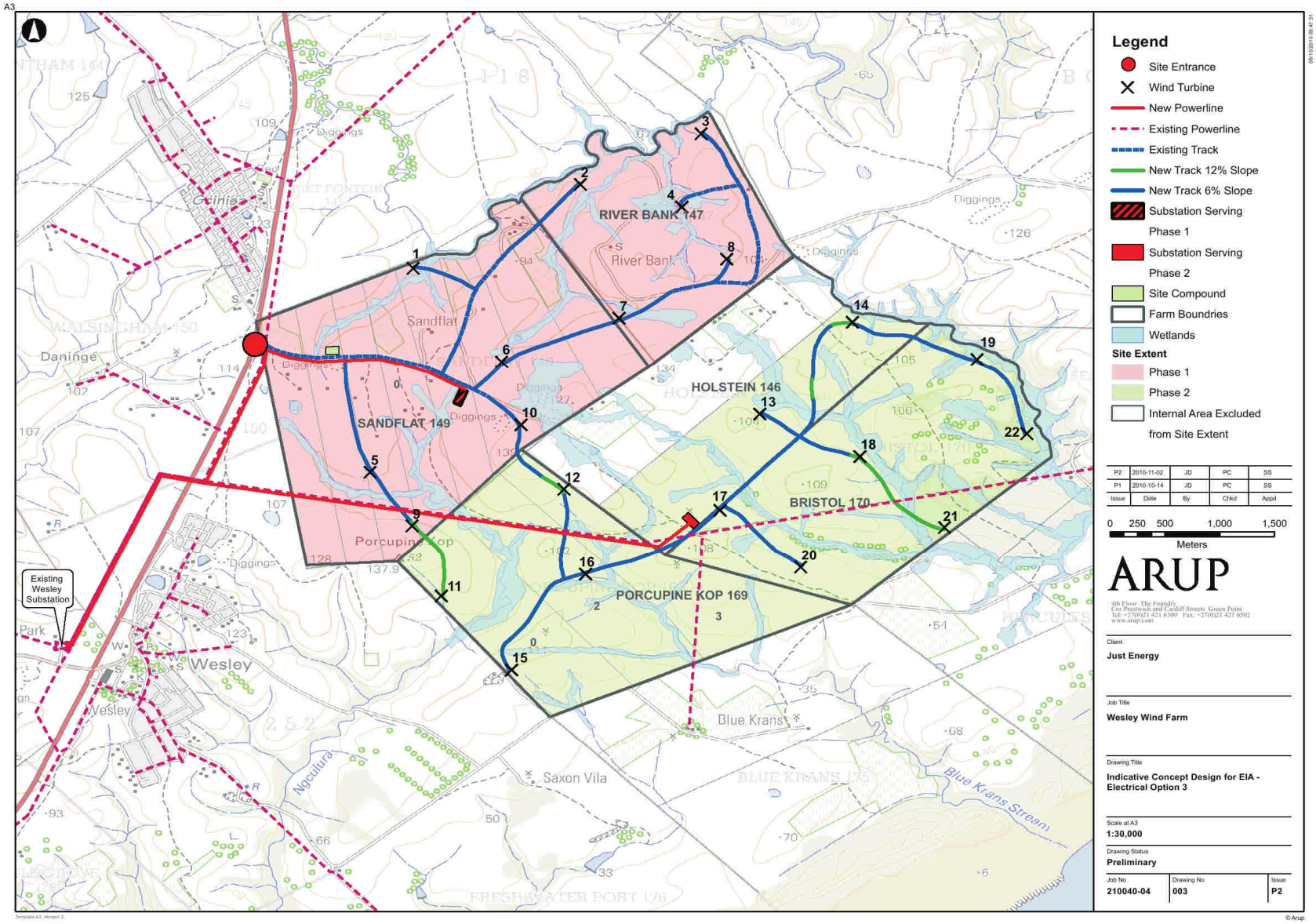


Figure 2.3: Layout option number 3

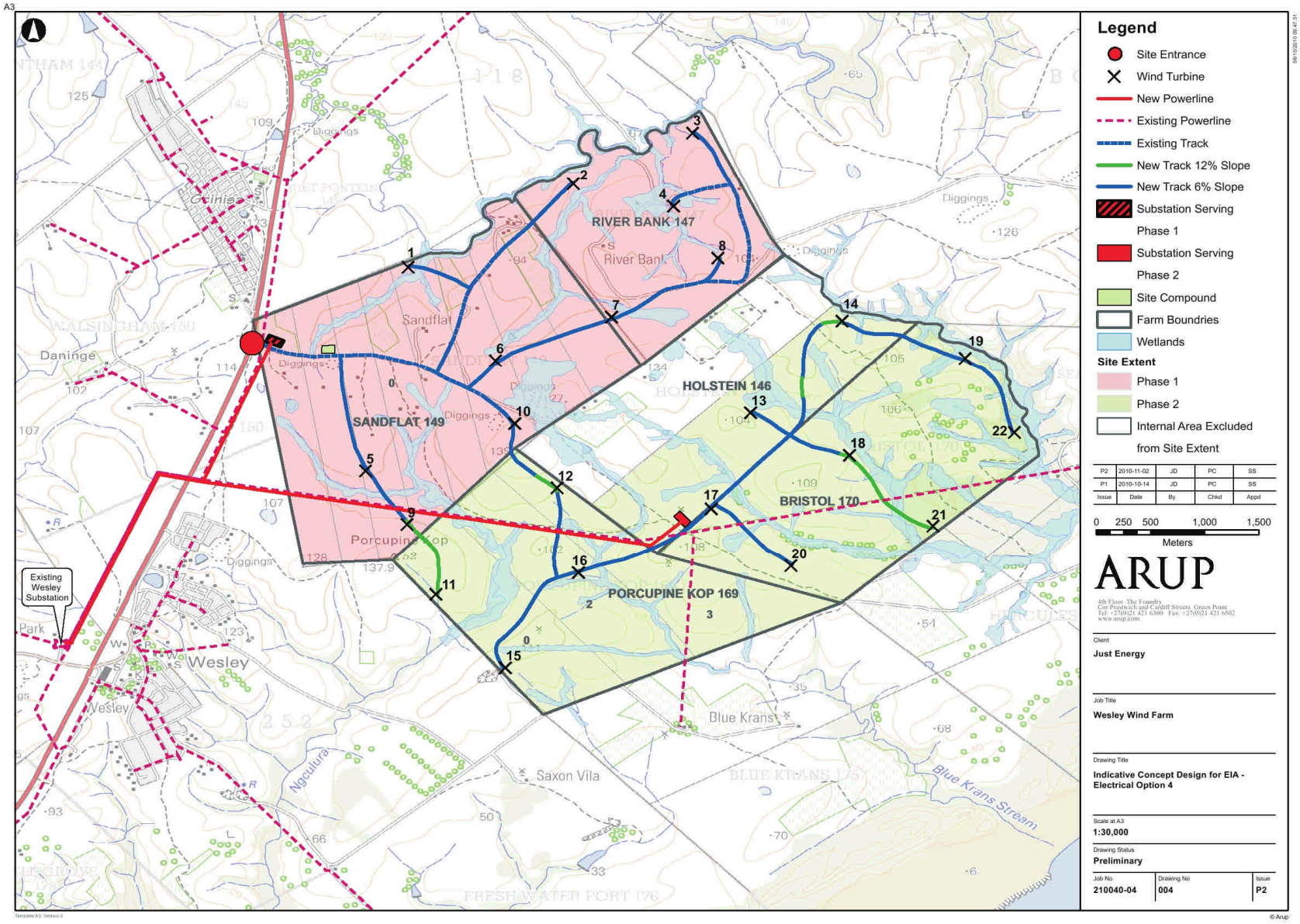


Figure 2.4: Layout option number 4

2.3.3 The 'do-nothing' Alternative

The 'do-nothing' alternative is the option of not constructing the Riverbank Wind Energy Facility on the identified site located 4 km north-east of Wesley. This alternative would result in no environmental impacts on the site or surrounding area. However, should the facility not be developed the local community will not receive an annual revenue source via the equity shareholding, and the landowners would not receive any annual rental income.

Furthermore the benefits related to the generation of electricity from renewable energy resources will not be realised. Failure to add the proposed electricity to the national grid would most likely result in additional consumption of fossil fuels to achieve the same level of electrical generation at other locations in the country. This is because the electricity demand in South Africa is placing increasing pressure on the country's existing power generation capacity. There is therefore a need for additional electricity generation options to be developed throughout the country.

The support for renewable energy policy is guided by the need to address climate change as well as a rationale that South Africa has a very attractive range of renewable resources, particularly solar and wind and that renewable applications are in fact the least-cost energy service in many cases - and more so when social and environmental costs are taken into account.

The generation of electricity from renewable energy in South Africa offers a number of socio-economic and environmental benefits. These benefits are explored in further detail in the South Africa Renewable Energy Feed-in Tariff (REFIT) Regulatory Guideline published by NERSA (March 2009), and include:

Support for international agreements - the effective deployment of renewable energy provides a tangible means for South Africa to demonstrate its commitment to its international agreements under the Kyoto Protocol, and for cementing its status as a leading player within the international community.

Exploitation of our significant renewable energy resource - at present, valuable national resources including biomass by-products, solar radiation, and wind power remain largely unexploited. The use of these energy flows will strengthen energy security through the development of a diverse energy portfolio.

Increased energy security - the current electricity crisis in South Africa highlights the significant role that renewable energy can play in terms of power supplementation. In addition, given that renewables can often be deployed in a decentralised manner close to consumers, they offer the opportunity for improving grid strength and supply quality, while reducing expensive transmission and distribution losses.

Pollution reduction - the releases of by-products through the burning of fossil fuels for electricity generation has a particularly hazardous impact on human health and contributes to ecosystem degradation.

Climate friendly development - the uptake of renewable energy offers the opportunity to address energy needs in an environmentally responsible manner and thereby allows South Africa to contribute towards mitigating climate change through the reduction of greenhouse gas (GHG) emissions. South Africa is estimated to be responsible for ~1% of global GHG emissions and is currently ranked 9th worldwide in terms of per capita CO_2 emissions.

Employment creation - the sale, development, installation, maintenance, and management of renewable energy facilities have significant potential for job creation in South Africa.

Acceptability to society - renewable energy offers a number of tangible benefits to society including reduced pollution concerns, improved human and ecosystem health and climate friendly development.

Support to a new industry sector - the development of renewable energy offers the opportunity to establish a new industry within the South African economy.

Within a policy framework, the development of renewable energy in South Africa is supported by the White Paper on Renewable Energy (November 2003), which has set a target of 10,000 GWh renewable energy contributions to final energy consumption by 2013. The target is to be achieved primarily through the development of wind, biomass, solar and small-scale hydro.

The 'do nothing' alternative will not assist the South African government in addressing climate change, in reaching the set targets for renewable energy, nor will it assist in supplying the increasing electricity demand within the country. In addition the Eastern Cape power supply will be deprived of an opportunity to benefit from the additional generated power being evacuated directly into the Provinces' grids.

The 'do nothing alternative is, therefore, not a preferred alternative.

2.4 Wind Energy as a Power Generation Technology

Wind power is the conversion of wind energy into a useful form, such as electricity, using wind turbines. The use of wind for electricity generation is a non-consumptive use of a natural resource, and produces an insignificant quantity of greenhouse gases in its

lifecycle. Wind power consumes no fuel for continuing operation, and has no emissions directly related to electricity production.
Wind energy is one of the fastest growing electricity generating technologies and features in energy plans worldwide. Use of wind for electricity generation is essentially a non-consumptive use of a natural resource, and produces an insignificant quantity of greenhouse gases in its life cycle. Wind power consumes no fuel for continuing operation, and has no emissions directly related to electricity production. Operation does not produce carbon dioxide, sulphur dioxide, mercury, particulates, or any other type of air pollution, as do fossil fuel power sources. A wind energy facility also qualifies as a Clean Development Mechanism (CDM) project (i.e. a financial mechanism developed to encourage the development of renewable technologies) as it meets all international requirements in this regard.

Environmental pollution and the emission of CO_2 from the combustion of fossil fuels constitute a threat to the environment. The use of fossil fuels is reportedly responsible for ~70% of greenhouse gas emissions worldwide. The climate change challenge needs to include a shift in the way that energy is generated and consumed. Worldwide, many solutions and approaches are being developed to reduce emissions. However, it is important to acknowledge that the more cost effective solution in the short-term is not necessarily the least expensive long-term solution. This holds true not only for direct project cost, but also indirect project cost such as impacts on the environment. Renewable energy is considered a 'clean source of energy' with the potential to contribute greatly to a more ecologically, socially and economically sustainable future. The challenge now is ensuring wind energy projects are able to meet all economic, social, and environmental sustainability criteria.

Wind energy has the attractive attribute that the fuel is free. The economics of a wind energy project crucially depend on the wind resource at the site. Detailed and reliable information about the speed, strength, direction, and frequency of the wind resource is vital when considering the installation of a wind energy facility, as the wind resource is a critical factor to the success of the installation.

Wind speed - is the rate at which air flows past a point above the earth's surface. Average annual wind speed is a critical siting criterion, since this determines the cost of generating electricity. With a doubling of average wind speed, the power in the wind increases by a factor of 8, so even small changes in wind speed can produce large changes in the economic performance of a wind energy facility (for example, an increase of average wind speed from 22 km/hr to 36 km/hr (6 m/s to 10 m/s) increases the amount of energy produced by over 130%). Wind turbines can start generating at wind speeds of between 10 km/hr to 15 km/hr (~3 m/s to 4 m/s), with nominal wind speeds required for full power operation varying between ~45 km/hr and 60 km/hr (~12.5 m/s to 17 m/s). Wind speed can be highly variable and is affected by a number of factors, including surface roughness of the terrain.

Wind power - is a measure of the energy available in the wind.

Wind direction - at a site is important to understand, but it is not critical in site selection as wind turbine blades automatically turn to face into the predominant wind direction at any point in time.

South Africa can be considered as having a moderate wind resource as compared to Northern Europe (Scandinavia), Great Britain and Ireland, New Zealand and Tasmania. Typical annual wind speeds range from 15 km/hr to 25 km/hr (4 m/s to 7 m/s) around South Africa's southern, eastern and western coastlines (with more wind typically along the coastline). This relates to an expected annual energy utilisation factor of between 15% and 30%, the value depending on the specific site selected. It is commonly accepted that wind speeds of 25 km/hr to 30 km/hr (7 m/s to 8 m/s) or greater are required for a wind energy facility to be economically viable in Europe.

The wind speed measurements taken at a particular site are affected by the local topography (extending to a few tens of kilometres from the mast) or surface roughness. This is why local on-site monitored wind speed data is so important for detailed wind energy facility design. The effect of height variation/relief in the terrain is seen as a speeding-up/slowing-down of the wind due to the topography. Elevation in the topography exerts a profound influence on the flow of air, and results in turbulence within the air stream, and this has to be taken into account in the placement of turbines.

A wind resource measurement and analysis programme is being conducted by Just Energy to design and undertake wind monitoring feasibility studies) for the site proposed for development, as only on-site measured data will provide a robust prediction of the facility's expected energy production over its lifetime. Just Energy has installed a wind monitoring mast on the proposed site. The design (and micro-siting) of a wind energy facility is sensitive to the predominant wind directions and wind speeds for the site. Although modern wind turbines are able to yaw to the direction of the wind, the micro-siting must consider the wind direction and strength of the wind in the optimal positioning of the turbines.

The placement of a wind energy facility and the actual individual turbines must, therefore, consider technical factors including:

» The wind resource;
» Topographical features or relief affecting the flow of the wind (e.g. causing turbulence of air flow); and
» Effect of adjacent turbines on wind flow and speed – specific spacing is required between turbines in order to reduce the effects of wake turbulence.

Wind turbines typically need to be spaced approximately 2 to 3xD apart, and 5 to 7xD where a turbine is behind another (D = the diameter of the rotor blades). This is required to minimise the induced wake effect the turbines might have on each other. Considering a typical 2 MW capacity turbine whose rotor is approximately 90 m in diameter, each turbine would be separated by approximately 180 m to 300 m. The erection of turbines in parallel rows one behind another would require a distance between rows of 500 m to 700 m to avoid wake effects from one turbine onto another.

2.5 How do Wind Turbines Function

Wind turbines, like windmills, are mounted on a tower to capture the most energy. The kinetic energy of wind is used to turn a wind turbine to generate electricity. At 30 m or more aboveground, they can take advantage of the faster and less turbulent wind. Turbines catch the wind's energy with their propeller-like blades. Usually, two or three blades are mounted on a shaft to form a *rotor.* Generally a wind turbine consists of **three rotor blades** and a **nacelle** mounted at the tip of a tapered **steel tower**. The mechanical power generated by the rotation of the blades is transmitted to the generator within the nacelle via a gearbox and drive train.

Turbines are able to operate at varying speeds. The amount of energy a turbine can harness depends on both the wind velocity and the length of the rotor blades. It is anticipated that the turbines utilised for the proposed wind energy facility near Wesley will have a hub height of up to 90 m, and a rotor diameter of up to 90 m (i.e. each blade approximately 45 m in length). These turbines would have a generating capacity of 3 MW. Wind turbines can start generating at wind speed of between 10 km/hr to 15 km/hr (approximately 3 m/s to 4 m/s), with nominal wind speeds required for full power operation varying between ~45 km/hr and 60 km/hr (12.5 m/s and 17 m/s).

The proposed facility would accommodate up to 22 wind turbines. As the performance of the turbines is determined by disturbances to the wind resource, they must be appropriately spaced within the facility. Turbines would, therefore, be positioned within an area of approximately 20 km^2. The overall aim of the design and layout of the facility is to maximise electricity production through exposure to the wind resource, while minimising infrastructure, operation, and maintenance costs, as well as social and environmental impacts.

Other infrastructure associated with the facility includes service buildings (i.e. storage areas and a workshop), internal access roads (i.e. for construction and maintenance purposes), and a substation (placed within the developmental footprint). The construction phase of the Riverbank Wind Energy Facility is dependent on the number of turbines erected and is estimated at 8 – 16 months (i.e. both phases). The lifespan of the facility is approximated at 20 to 30 years, with maintenance.

2.5.1 Main Components of a Wind Turbine

The turbine consists of the following major components (refer to Figure 2.5):

» The rotor;
» The nacelle;
» The tower; and
» The foundation unit.

The **rotor -** the portion of the wind turbine that collects energy from the wind is called the rotor. The rotor converts the energy in the wind into rotational energy to turn the generator. The rotor has three blades that rotate at a constant speed of about 15 to 28 revolutions per minute (rpm). The speed of rotation of the blades is controlled by the nacelle, which can turn the blades to face into the wind ('yaw control'), and change the angle of the blades ('pitch control') to make the most use of the available wind. The rotor blades function in a similar way to the wing of an aircraft, utilising the principles of **lift** (Bernoulli). When air flows past the blade, a wind speed and pressure differential is created between the upper and lower blade surfaces. The pressure at the lower surface is greater and thus acts to "lift" the blade. When blades are attached to a central axis, like a wind turbine rotor, the lift is translated into rotational motion. Lift-powered wind turbines are well suited for electricity generation. The rotation of the rotor blades produces a characteristic 'swishing' sound as the blades pass in front of the tower roughly once a second. The other moving parts, the gearbox and generator, cannot be heard unless the observer is physically inside the turbine tower. The tip-speed is the ratio of the rotational speed of the blade to the wind speed. The larger this ratio, the faster the rotation of the wind turbine rotor at a given wind speed. Electricity generation requires high rotational speeds. Lift-type wind turbines have optimum tip-speed ratios of around 4 to 5.

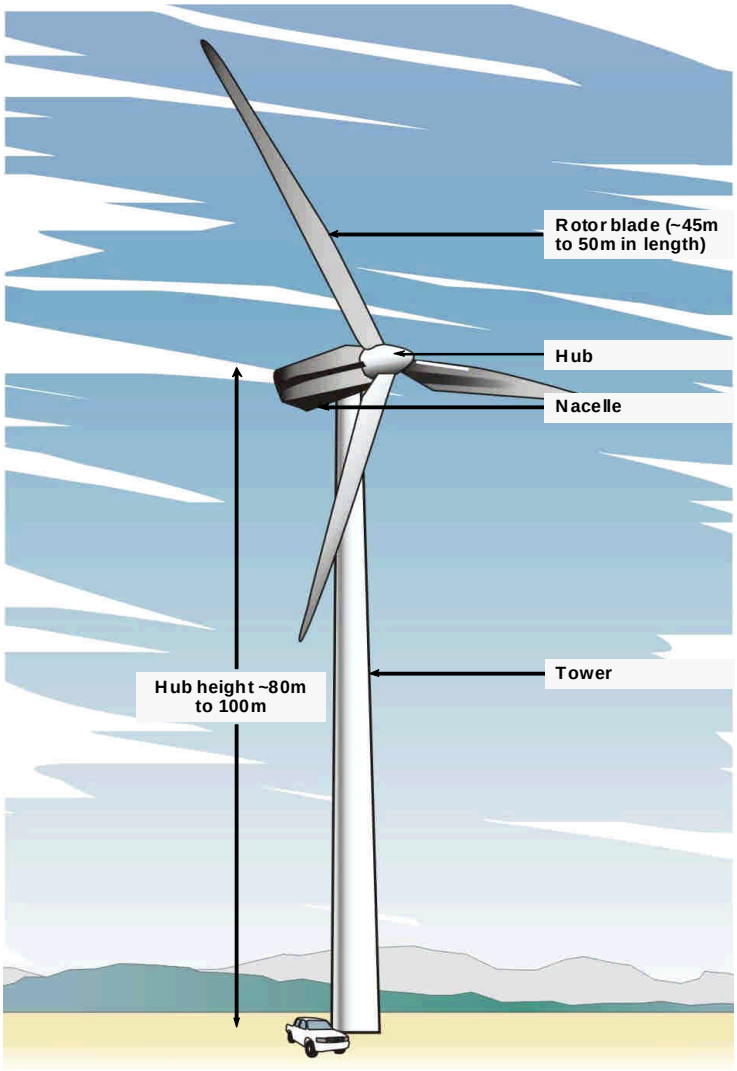


Figure 2.5: Illustration of the main components of a wind turbine.

The **nacelle** contains the generator, control equipment, gearbox, and anemometer for monitoring the wind speed and direction (as shown in Figure 2.6).

The **generator** is what converts the turning motion of a wind turbine's blades into electricity. Inside this component, coils of wire are rotated in a magnetic field to produce electricity. The generator's rating, or size, is dependent on the length of the wind turbine's blades because more energy is captured by longer blades.

***The* tower** which supports the rotor is constructed from tubular steel. The tower will be between up to 90 m tall, depending on the turbine type chosen for the wind energy facility. The nacelle and the rotor are attached to the top of the tower.

The tower on which a wind turbine is mounted is not just a support structure. It also raises the wind turbine so that its blades safely clear the ground and so it can reach the

stronger winds at higher elevations. The tower must be strong enough to support the wind turbine and to sustain vibration, wind loading and the overall weather elements for the lifetime of the wind turbine.

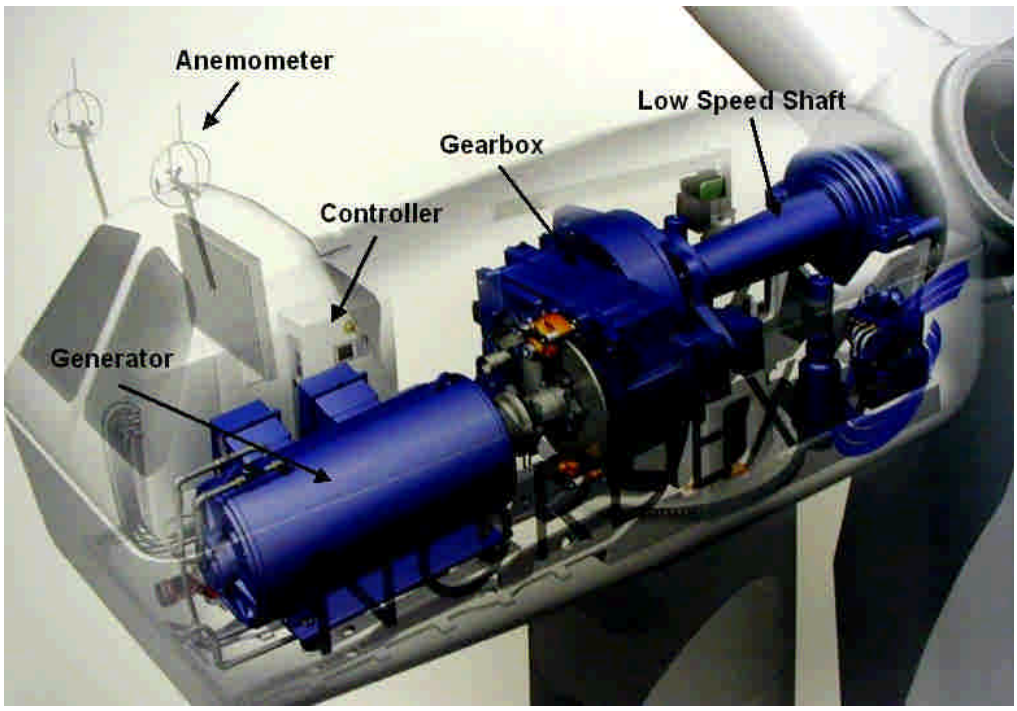


Figure 2.6: Detailed structure of a nacelle of a horizontal axis turbine

2.5.2 Operating Characteristics of a Wind Turbine

A turbine is designed to operate continuously, unattended and with low maintenance for more than 20 years or >120 000 hours of operation. Once operating, a wind energy facility can be monitored and controlled remotely, with a mobile team for maintenance, when required.

The **cut-in speed** is the minimum wind speed at which the wind turbine will generate usable power. This wind speed is typically between 10 and 15 km/hr (~3 m/s and 4 m/s).

At very high wind speeds, typically over 90 km/hr (25 m/s), the wind turbine will cease power generation and shut down. The wind speed at which shut down occurs is called the **cut-out speed**. Having a cut-out speed is a safety feature which protects the wind turbine from damage. Normal wind turbine operation usually resumes when the wind drops back to a safe level.

It is the flow of air over the blades and through the rotor area that makes a wind turbine function. The wind turbine extracts energy by slowing the wind down. The theoretical

maximum amount of energy in the wind that can be collected by a wind turbine's rotor is approximately 59%. This value is known as the Betz Limit. In practice, the collection efficiency of a rotor is not as high as 59%. A more typical efficiency is 35% to 45%. A wind energy system (including rotor, generator etc) does not exhibit perfect efficiencies, and will therefore deliver between 10% and 30% of the original energy available in the wind (between 20% to 25% being typical for modern systems).

Wind turbines can be used as stand-alone applications, or they can be connected to a utility power grid. For utility-scale sources of wind energy, a large number of wind turbines are usually built close together to form a wind energy facility.

2.6 Project Construction Phase

The following primary construction activities will be undertaken:

» Conduct surveys;
» Establishment of access roads within the site;
» Undertake site preparation;
» Establishment of construction camps and laydown areas;
» Construct foundations;
» Transport components to site;
» Assemble wind turbines;
» Construct on-site substation;
» Establish ancillary infrastructure;
» Install below-ground electrical cables between turbine sites and the substation;
» Construct overhead power lines connecting from site to Wesley Substation;
» Commission site; and
» Site remediation.

2.6.1 Estimated Timeframes for the Construction Phase

Estimates of overall construction timescales are presented below:

Scenario	Timescale
Phase 1 only	8 – 12 months
Phase 2 only - following on from Phase 1 at a later date	8 – 12 months
Phase 1 and 2 constructed in parallel	12 – 16 months

The following activity specific timeframes should also be noted:

» Road construction timescales are subject to quarrying requirements and associated timescales.
» Erection of a single turbine will typically commence following a 2 week curing time of the associated foundation.
» Following curing of foundations, erection of a single turbine would require 3 - 4 days to complete after offloading on site – subject to weather conditions.
» For multiple turbines the erection processes would overlap enabling reduction in overall timescale.

2.6.2 Labour Requirements during the Construction Phase

The construction phase is envisaged to employ approximately 30 individuals with 50%, 40% and 10% accruing to low skilled, semi-skilled, and highly skilled positions respectively. The estimated wage bill for the construction phase and breakdown per skills categories is described below:

	Construction months	% of total jobs	Total per group
Low	12	50	54 000
Semi-skilled	12	40	64 800
Skilled	12	10	28 800
			R1 385 921.20

It is envisaged that much of the wages will be spent in the immediate local area, which will provide opportunities for local restaurants and shops.

Construction workers will be housed in the local towns of Wesley, Bell, Bodium, Hamburg, and Gcinisa. Currently, Just Energy is seeking opportunities to use South African based turbine suppliers, which will assist in the requirement and demand for the development of a local, rather than imported skill set. However, given the technical nature of the project, there may be a possibility that much of the higher skilled jobs are imported. The sector of the local economy most likely to benefit is the service industry, as it will provide services such as shops, eateries. The development of the local supply chain is a key benefit to the project.

2.6.3 Acquisition of Construction Related Materials

During construction, the access roads must be built to support 15 ton axle loads to support the abnormal loads delivering the nacelles, crawler crane, and other components. Sands and aggregate required for all construction activities will be sourced from a combination of the following:

» Road and turbine foundations excavations, where possible;
» Existing approved sand and gravel pits within the region; and
» Approved commercial suppliers.

It is assumed existing commercial quarries / mining permits have already been authorised and are available in the area. If not, an appropriate source of material (or borrow pit) will have to be located and mining rights established through the Department of Mineral Resources.

2.6.4 Use of hazardous materials during the construction phase

The construction phase is not considered to require any hazardous substances considered abnormal to a typical building construction project. The common hazardous substances that may be present on site are:

» Fuel (diesel/petrol);
» Lubrication oils;
» Brake fluid;
» Refrigerant gases;
» Cement;
» Gases and fumes from welding/cutting steelwork on site;
» Dust from concrete works; and
» Specialist grouts.

When not in use, all hazardous substances will be stored and secured within the central site construction compound.

2.6.5 Conduct Surveys

Prior to initiating construction, a number of surveys will be required including, but not limited to, geotechnical survey, site survey and confirmation of the turbine micro-siting footprint, survey of substation site/s and survey of power line servitudes to determine tower locations.

2.6.6 Undertake Site Preparation

Site preparation activities will include clearance of vegetation at the footprint of each turbine, establishment of laydown areas, the establishment of internal access roads and excavations for foundations. These activities will require the stripping of topsoil, which will need to be stockpiled, backfilled and/or spread on site.

Site preparation will be undertaken in a systematic manner to reduce the risk of open ground to erosion. In addition, site preparation will include search and rescue of floral

species of concern (where required), as well as identification and excavation of any sites of cultural/heritage value (where required).

2.6.7 Establishment of Access Roads

The site is located adjacent to the R72 which will allow for access in conjunction with an existing low order gravel farm road (DR07491). Based on the current turbine layout that, it is envisaged that only this secondary road would be used during the construction phase to access the site. The R72 / DR07491 road intersection will need splays in the fence line and cattle grid will need to be considerably set back from the road edge to provide sufficient space for the swept path of the largest vehicle on approach to the existing access road. A 60 m setback distance from the road edge is recommended. This will be a permanent feature due to the potential need to bring in replacement blades during the operational phase / life of the facility.

Although the DR07491 is unlikely to have been subjected to vehicle loading of the same magnitude and intensity to that expected during construction of the wind facility, it is assumed for the purposes of this assessment that it will be predominantly suitable for the construction related traffic in terms of load carrying capability and durability. It is, however, likely that localised road upgrading will be required to satisfy the turbine suppliers track width and alignment requirements. Information pertaining to the extent of upgrade required will be assessed further by the project developer.

Within the site itself, access will be required from the existing secondary road to the turbine locations, substation(s), and ancillary infrastructure for construction purposes (and later limited access for maintenance). The road alignment has been developed in response to the micro positioning of the wind turbines. The service road can also function as the main transport route during construction. These internal roads need to be designed to accommodate the swept path (i.e. the space required in the bends and corners so that the wheels remain on the roadway) and imposed loads of all the abnormal vehicles. The following information pertains to the construction of these internal access tracks:

» Design assumes longitudinal slope 8 degrees (maximum 14%); lateral slope 2 degrees (maximum 3.5%). Road sections with a gradient in the range 6 - 12% have been minimised where possible.
» Abnormal vehicles with 67 ton to 83 ton nacelles and crawler crane components may require flatter grades on site, or can be accommodated with a multiple driven axle prime mover.
» Access tracks are assumed approximately 5 – 6 m wide with a 25 m turning radii. Track make-up will be designed to accommodate approximately 15 ton axle loads.

» Existing gravel roads will be utilised where possible. The existing internal gravel access roads between the turbine bases will all need to be upgraded to a pavement structure capable of carrying construction vehicles and the abnormal loads.
» At this stage it is assumed that a nominal access track make-up in the order of 500 mm thick will be required for the access track construction although an increased depth of fill will be required in some areas to overcome localised variations in ground level. The access track construction will comprise compacted suitable rock-fill with a layer of higher quality surfacing stone on top. A surfacing layer in the order of 150 mm thick would normally be required.
» New access tracks would follow the existing ground profile as much as possible to minimise or preferably balance the cut / fill requirements in construction and will have a running surface of 6 m. Where more detailed topography data becomes available during detailed design, the track layouts will require minor refinement.
» All four electrical design options have been catered for in the track layout. Crossings under the electrical power line have been minimised where possible although it is assumed that this does not provide a significant constraint.
» After construction the roads will remain as internal access roads to the existing farms and turbine sites.

2.6.8 Establishment of Construction Camps and Laydown Areas on Site

A temporary site construction compound will be established on the site for the duration of the construction period. The compound will typically comprise equipment storage and handling areas and temporary storage containers. For general construction and storage requirements a site compound in the order of 100 m x 75 m will be required. Whereby on-site concrete batching is executed, an additional area in the order of 55 m x 75 m will be required. A laydown area will be required for building materials and equipment in order to establish these facilities.

A compacted, level lay down area will need to be established adjacent to each turbine location to accommodate crane equipment for erection of each turbine. Currently in South Africa, two lifting crane technology options are potentially available adoption. These options and the associated lay-down area requirements are summarised below:

Option 1
» Traditional crawler crane and assembly crane
» Lay down area required of approximately 150 m x 20 m

Option 2
» Compact mobile crane and assembly crane
» Lay down area required of approximately 25 m x 50 m

For both options, the assembly crane needs to access the main lifting crane from all sides and when the main lifting crane is fully assembled on the ground.

2.6.9 Construct Foundations

Significant quantities of concrete will be required for the base foundation of each turbine. Each turbine installation requires approximately 800 m^3 of concrete to generate an approximate foundation of 20 m (l) x 20 m (w) x 2 m (d). For the current turbine configuration this equates to approximately 8000 m^3 (Phase 1), 9600 m^3 (Phase 2) and 17 600 m^3 (Phase 1 & 2). At this stage ready mix concrete will be delivered to site from a nearby location in the adjacent areas of Wesley or Gcinisa.

2.6.10 Transport of Components and Equipment to Site

The wind turbine components (nacelles and blades) will be imported. The tower sections may also be imported, but there is a possibility that they will be manufactured "locally" in the Eastern Cape. Pre-feasibility work has suggested three harbours as possible entry points for the imported components, namely Port Elizabeth, Coega, and East London. All three are deep-water ports, geared for handling containers, but have no heavy lifting equipment on the quayside. The route from harbour to site which has been regarded has most suitable is the R72 from East London to Wesley and is described below (refer to Figure 2.7.:

» From East London, the R72 offers an excellent parallel and more direct route than the N2; trip distance to the site is approximately 90 km.
» At the Port of East London there may be the need for minor roadway alterations to accommodate the sharp changes in gradient associated with navigating a level crossing.
» There may be the need to make temporary alterations to internal fences at the quayside as well as at the Port access gates to accommodate the right turn out of the Port onto Bank Street / Military Road.
» At the Military Road / R72 intersection, there may be the need to temporarily remove road signs and street lighting to accommodate the left turn onto the R72 westbound.
The route has a number of river bridge crossings, which will need to be cleared for load bearing capacity by the permitting authority. The river bridge crossings include Igoda River, Gulu River, Umgwenyana River, Mkantsi River, Ncertha River, Tylomnqa River, and Keisikamma River.

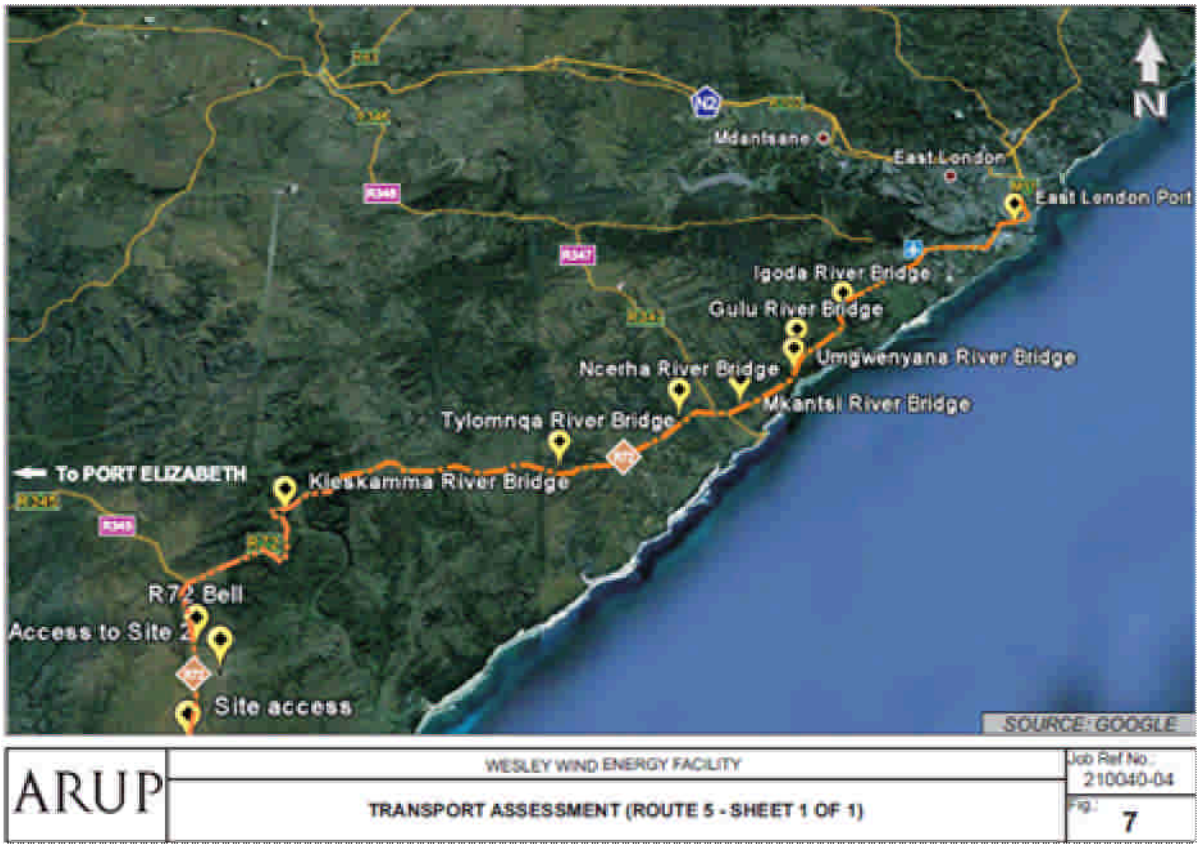


Figure 2.7: Transportation route from East London

The turbine unit's tower, nacelle, and three rotor blades are defined as abnormal loads in terms of Road Traffic Act (Act No 29 of 1989) by virtue of the dimensional limitations (abnormal length of the blades) and load limitations (i.e. the nacelle). The dimensional requirements of the load may require alterations to the existing road infrastructure (e.g. widening on corners), accommodation of street furniture (e.g. street lighting, traffic signals, telephone lines etc.), and protection of road-related structures (i.e. bridges, culverts, portal culverts, retaining walls, etc.). Other abnormal loads associated with the construction phase are the transportation of various specialised construction and lifting equipment (i.e. cranes) and their component parts which will most likely be transported from Gauteng to the site. The location of this equipment and hence the transport route required to get it to site is unknown at this stage. The delivery of this equipment could equate to up to 20 truck loads and 2 - 3 abnormal loads but will be a once-off trip for each of the crane components where after the crane will remain on site for the duration of the construction phase.

In addition to the specialised lifting equipment/cranes, the normal civil engineering construction equipment will need to be brought to the site for the civil works (e.g. excavators, trucks, graders, compaction equipment, cement trucks, etc.). The components required for the establishment of the substation (including transformers) as

well as the power lines (including towers and cabling) will also be transported to site as required.

2.6.11 Assemble Wind Turbines

A large lifting crane will be brought on site and will be used to lift the tower sections into place. The nacelle, which contains the gearbox, generator, and yawing mechanism, will then be placed onto the top of the assembled tower. Thereafter rotor will be assembled/partially assembled (i.e. the blades of the turbine) on the ground. It will then be lifted to the nacelle and bolted in place. A small crane will likely be needed for the assembly of the rotor while a large crane will be needed to put it in place. Erection of a single turbine will typically commence following a 2 week curing time of the associated foundation. Following curing of foundations, erection of a single turbine would require 3 - 4 days to complete after offloading on site.

2.6.12 Construct On-Site Substation

The underground cables evacuating the generated power from the individual turbines will join at the on-site substation/s; the position of which will be informed by the final micro-siting/positioning of the wind turbines.

The construction of the substation would require a survey of the site; site clearing and levelling; and construction of access road/s (where required); construction of a substation terrace and foundation; assembly, erection and installation of equipment (including transformers); connection of conductors to equipment; and rehabilitation of any disturbed areas and protection of erosion sensitive areas.

The proposed substation would be constructed in the following simplified sequence:

» Step 1: Survey of the site;
» Step 2: Site clearing/levelling and construction of access road to substation site;
» Step 3: Construction of terrace and substation foundation;
» Step 4: Assembly, erection and installation of equipment (including transformers);
» Step 5: Connection of conductors to equipment; and
» Step 6: Rehabilitation of disturbed areas and protection of erosion sensitive areas.

2.6.13 Establishment of Ancillary Infrastructure

Within each of the electrical substation compounds, a single-storey building of approximately 150 – 350 m^2 will be required to accommodate the following:

» Control room;
» Workshop;
» HV switchgear room;

» Mess room;
» Toilets;
» SCADA room; and
» Storeroom.[3]

2.6.14 Connection of Wind Turbines to the Substation

Each wind turbine will be connected to the substation via underground electrical cables (where possible). The installation of these cables will require the excavation of trenches of approximately 1 m deep within which they can then be laid. The underground cables will be planned to follow the internal access roads, where possible.

2.6.15 Connect Substation to Power Grid

In order to transfer power generated at the facility site to the Eskom grid, overhead power lines will connect between the on-site substations and Eskom's Wesley Substation located approximately 5 km west of the site. Refer to Section 2.3.2 for the options being considered. Indicative concept design layouts present four options for overhead power lines routes. The route options are independent of the final grid connection voltage. The options can be summarised as follows:

2.6.16 Commission Facility

The commissioning process will involve the following steps:

» Standard electrical tests for all sub-station and power line infrastructure, in accordance with regulatory requirements.
» Turbine operational tests in accordance with supplier's requirements.
» Inspection of civil engineering installations and construction quality records.

Commissioning of individual turbines will take 2 - 3 days, utilising experienced staff, approved by turbine suppliers. Complete commissioning periods for electrical infrastructure will be dependent on the commissioning program for the turbines.

2.6.17 Undertake Site Rehabilitation

Once construction is completed and once all construction equipment is removed, the site must be rehabilitated where practical and reasonable. On full commissioning of the facility, any access points to the site which are not required during the operational phase must be closed and prepared for rehabilitation.

[3] Supervisory control and data acquisition, it generally refers to industrial control systems: computer systems that monitor and control industrial, infrastructure, or facility-based processes.

2.7 Project Operation Phase

The operational life of the wind turbines is expected to be a minimum of 20 - 30 years assuming regular maintenance and/or upgrades in technology. During this time the community on whose land the proposed facility would be sited will be direct beneficiaries through a monthly yearly rental agreement with Just Energy – calculated as 1.5 percent of REFIT electricity sales revenue (pre-tax). As part of the benefits to the community, Just Energy is initiating legally binding lease agreements with the landowners at Sandflat 149 and Riverbank 147. The majority of the land parcels are held in title by deceased ancestors of the current occupiers. Just Energy is funding the finalisation of the deceased estates and transfer of the land title to the appropriate heirs. A conveyancer is currently overseeing this process, which will afford living heirs at Sandflat and Riverbank with their rightful property ownership status and documentation. This is addition to a 10% equity stake in the project that has been set aside for the local community.

2.7.1 Operation and Maintenance of the Wind Turbines

Following the commissioning stage, the turbines will be operated and monitored remotely via automated systems. As such, it is likely that no permanent staff will be required on site for any extended period during normal operation. Each turbine will be operational except under circumstances of mechanical breakdown, extreme weather conditions, or planned and reactive maintenance activities. Each wind turbine will be subject to periodic maintenance and in-person inspection at varying intervals. Maintenance will involve:

» Oil inspections and changes, related to gearboxes and gear oil system.
» Lubricant inspections and changes, related to the braking systems.
» Hydraulic brake fluid inspections and changes, related to the braking systems.
» Nacelle air-conditioning system refrigerant inspections and re-charging, where installed.

During maintenance activities a minimum of two people will be present on site.

2.7.2 Operation and Maintenance of the Electrical Infrastructure

Following commissioning of the electrical infrastructure it will be operated and monitored remotely via automated systems. As such, it is likely that no permanent staff will be required on site for any extended period during normal operation. The electrical infrastructure will be operational except under circumstances of mechanical breakdown or planned and reactive maintenance activities. The electrical infrastructure will be subject to periodic maintenance and in-person inspection at varying intervals monthly, annually, 2 - 4 yearly. Typical activities include:

General public safety inspection - annually

» Statutory warning signs;
» Fence and gate integrity;
» Soil erosion within and around perimeter;
» Evidence of vandalism and forced entry;
» Vegetation growth inside and around perimeter providing potential access; and
» Vandalism or forced entry.

Substation inspection and maintenance scope:

» Oil leaks;
» Sf6 levels;
» Transformer temperature;
» Fan inspection;
» Breather and moisture indicators;
» Indicator lights;
» Evidence of rodent intrusion;
» Battery maintenance;
» Circuit breaker maintenance;
» Transformer oil testing (every 2 years);
» Relay maintenance
    * Electro-mechanical relay inspection; and
    * Functional testing (every 4 years).
» Thermography – annually; and
» Series capacitor bank maintenance (where installed for power factor correction).

The above is indicative of typical maintenance work that needs to be done; there may be additional checks, inspections and tests depending on the actual equipment installed.

2.7.3 Operation and Maintenance of Access Roads

The main access road into the site is within the remit of the local road authority and will continue with route maintenance on an ad-hoc basis. The extent of internal access track

maintenance is dependent on the periodicity of maintenance access activities, the quality of stone sourced for construction and extent of rainfall. Throughout the operational life, replenishment of surfacing stone from erosion may be required. However, at the discretion of the developer, private internal access roads maybe either maintained or left to grow over.

2.7.4 Labour Considerations and Operating Budget

Approximately 10 full time jobs will create employment opportunities locally and regionally. Given the relative infancy of the wind energy sector in South Africa, imported skills may be employed, particularly in the early stages of the facility's operation. It is envisaged that to enhance opportunities for local community members, that local employment and skills development training programmes be implemented. The approximate breakdown is 20% (Low), 20% (Semi-skilled) and 60% (Skilled) jobs. Typical low skilled activities associated with the operational phase include security, gardening services, etc.

2.8 Project Decommissioning Phase

At the end of the economic operational life of the facility the existing turbines will be de-commissioned and removed. Following this process the following follow-on scenarios may be considered:

» Install new turbines;
» Install an alternative technology/infrastructure considered more appropriate at that time; and
» Re-habilitate the site for original/alternative use.

Basic decommissioning of the turbines would involve the following:

» Site preparation to facilitate transportation of dismantling equipment, mobilisation of construction equipment and removal of components e.g. rehabilitation of access tracks, crane lay-down areas and construction platforms.
» Dismantling and removal of all wind turbine components via crane.
» Disposal of all hazardous substances in accordance with regulatory requirements.
» Re-use, recycling or disposal of all components in accordance with regulatory requirements.

Further to this, dependent on the agreed future use for the site, the following activities may also be triggered:

» Breaking out the exposed up-stand section of the turbine foundations to a depth of 0.5m below ground level and re-establish with vegetation/topsoil;
» Demolition and removal of the substations and substation compound.

- Onsite cabling would be left buried in the cable trenches and cut off at around 0.6m below ground level.
- Although removal of the access tracks is feasible this may not constitute the best practicable environmental option. The access tracks would either be left exposed for the use of the landowner or be restored in agreement with the relevant authorities.

3.1 Policy and Planning Context for Wind Energy Facility Development

The need to expand electricity generation capacity in South Africa is based on **national policy** and informed by on-going strategic planning undertaken by the Department of Energy (DoE), the National Energy Regulator of South Africa (NERSA) and Eskom. The hierarchy of policy and planning documentation that support the development of renewable energy projects such as wind energy facilities is illustrated in Figure 1.1. These policies are discussed in more detail in the following sections, along with the provincial and local policies or plans that have relevance to the proposed wind energy facility's development.

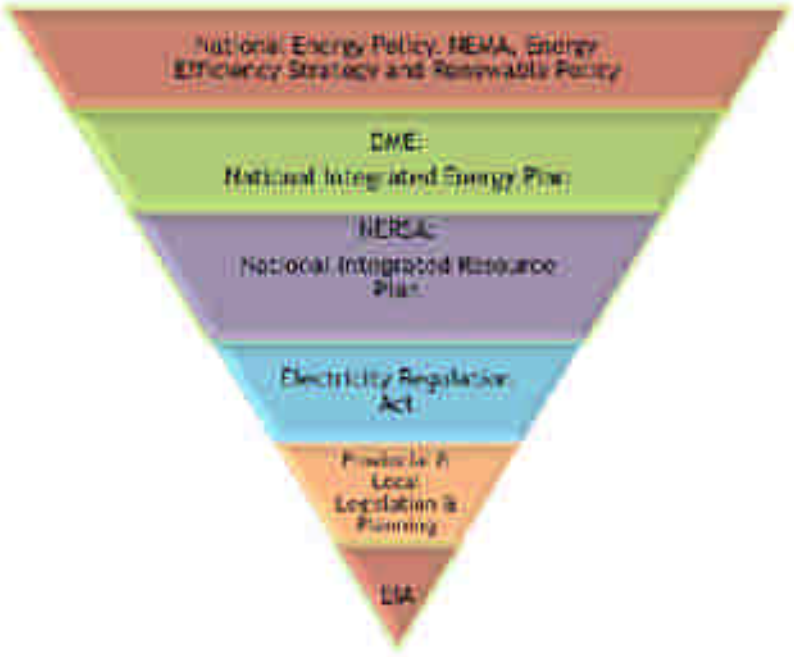


Figure 3.1: Hierarchy of electricity policy and planning documents

3.1.1 White Paper on the Energy Policy of the Republic of South Africa, 1998

Development within the energy sector in South Africa is governed by the White Paper on a National Energy Policy (the National Energy Policy), published by the Department of Minerals and Energy (DME) in 1998. This White Paper identifies key objectives for energy supply within South Africa, such as increasing access to affordable energy services, managing energy-related environmental impacts and securing energy supply through diversity.

Investment in renewable energy initiatives, such as the proposed wind energy facility, is supported by the White Paper on Energy Policy for South Africa. In this regard the document notes that government policy is based on an understanding that renewable energy sources have significant medium- and long-term commercial potential and can increasingly contribute towards a long-term sustainable energy future in South Africa. The support for renewable energy policy is guided by a rationale that South Africa has a very attractive range of renewable resources, particularly solar and ***wind*** and that renewable applications are in fact the least cost energy service in many cases; more so when social and environmental costs are taken into account.

3.1.2 Renewable Energy Policy in South Africa, 1998

The White Paper on Renewable Energy (DME, 2003) supplements the Energy Policy, and sets out Government's vision, policy principles, strategic goals, and objectives for promoting and implementing renewable energy in South Africa. The support for the Renewable Energy Policy is guided by a rationale that South Africa has a very attractive range of renewable resources, particularly solar and wind, and that renewable applications are, in fact, the least cost energy service in many cases from a fuel resource perspective (i.e. the cost of fuel in generating electricity from such technology); more so when social and environmental costs are taken into account. Government policy on renewable energy is therefore concerned with meeting economic, technical, and other constraints on the development of the renewable industry.

In order to meet the long-term goal of a sustainable renewable energy industry, the South African Government has set the following 10-year target for renewable energy: "*10 000 GWh (0.8 Mtoe) renewable energy contribution to final energy consumption by 2013 to be produced mainly from biomass, wind, solar and small-scale hydro. The renewable energy is to be utilised for power generation and non-electric technologies such as solar water heating and bio-fuels. This is approximately 4% (1 667 MW) of the estimated electricity demand (41 539 MW) by 2013"* (DME, 2003).

The White Paper on Renewable Energy states "*It is imperative for South Africa to supplement its existing energy supply with renewable energies to combat Global Climate Change which is having profound impacts on our planet. Wind energy is a clean, renewable resource and should be developed in South Africa on the basis of national policy as well as provincial and regional guidelines*."

3.1.3 Integrated Energy Plan, 2003

In response to the requirements of the National Energy Policy, the DME commissioned the Integrated Energy Plan (IEP) to provide a framework in which specific energy policies, development decisions and energy supply trade-offs can be made on a project-by-project basis. The framework is intended to create a balance between the energy

demand and resource availability to provide low cost electricity for social and economic development, while taking into account health, safety, and environmental parameters.
The current IEP recognises that South Africa is likely to be reliant on coal for at least the next 20 years as the predominant source of energy; however there is potential and a need to diversify energy supply through increased use of natural gas and new and renewable energies.

3.1.4 National Integrated Resource Plan, 2003/2004

In response to the National Energy Policy's objective relating to affordable energy services, NERSA commissioned a National Integrated Resource Plan (NIRP) in order to provide a long-term (from 2003 to 2022), cost-effective resource plan for meeting electricity demand, which is consistent with reliable electricity supply and environmental, social and economic policies. The planning horizon for the study was from 2003 to 2022. The objective of the NIRP is to determine the least-cost supply option for the country, provide information on the opportunities for investment into new power generating projects, and evaluate the security of supply. The Long-term Electricity Planning goal is to ensure sustainable development considering technical constraints, economic constraints, social constraints, and externalities.

Various demand side management and supply-side options are considered in the NIRP process, prior to identifying the least cost supply options for South Africa. The outcome of the process confirmed that coal-fired options are still required over the next 20 years and that additional base load plants will be required from 2010.

The first and interim IRP was developed in 2009 by the Department of Energy. The initial four years of this plan was promulgated by the Minister of Energy on 31 December 2009 and was updated on 29 January 2010. The Department of Energy is currently revisiting and revising the IRP, with the IRP2010 expected to be finalised in the near future.

3.1.5 Electricity Regulation Act, 2006

To contribute towards the renewable energy target set by the Government, socio-economic and environmentally sustainable growth, and kick start and stimulate the renewable energy industry in South Africa, Renewable Energy Feed-in Tariffs (REFIT) have been set by the National Energy Regulator of South Africa (NERSA). REFITs are, in essence, guaranteed prices for electricity supply rather than conventional consumer tariffs. The basic economic principle underpinning the REFITs is the establishment of a tariff (price) that covers the cost of generation plus a "reasonable profit" to induce developers to invest. This is quite similar to the concept of cost recovery used in utility rate regulation based on the costs of capital. Feed-in tariffs to promote renewable energy have now been adopted in over 36 countries around the world. The

establishment of the Renewable Energy Feed-In Tariff (REFIT) in South Africa provides the opportunity for an increased contribution towards the sustained growth of the renewable energy sector in the country, the region and internationally, and promote competitiveness for renewable energy with conventional energies in the medium- and long-term. Under the National Energy Regulator Act, 2004 (Act No 40 of 2004), the Electricity Regulation Act, 2006 (Act No 4 of 2006) and all subsequent relevant Acts of Amendment, NERSA has the mandate to determine the prices at and conditions under which electricity may be supplied by licence to Independent Power Producers (IPPs).

3.2 Regulatory Hierarchy for Energy Generation Projects

The South African energy industry is evolving rapidly, with regular changes to legislation and industry role-players. The regulatory hierarchy for an energy generation project of this nature consists of three tiers of authority who exercise control through both statutory and non-statutory instruments – that is National, Provincial and Local levels.

At National Level, the main regulatory agencies are:

Department of Energy (formerly DME)	This department is responsible for policy relating to all energy forms, including renewable energy. Wind energy is considered under the White Paper for Renewable Energy and the Department undertakes research in this regard. It is the controlling authority in terms of the Electricity Act (Act No 41 of 1987).
National Energy Regulator of South Africa (NERSA)	This body is responsible for regulating all aspects of the electricity sector, and will ultimately issue licenses for wind energy developments to generate electricity.
Department of Environmental Affairs (DEA)	This Department is responsible for environmental policy and is the controlling authority in terms of NEMA and the EIA Regulations. The DEA is the competent authority for this project, and charged with granting the relevant environmental authorisation.
The South African Heritage Resources Agency (SAHRA)	The National Heritage Resources Act (Act No 25 of 1999) and the associated provincial regulations provides legislative protection for listed or proclaimed sites, such as urban conservation areas, nature reserves and proclaimed scenic routes.
Department of Transport - Civil Aviation Authority (CAA)	This department is responsible for aircraft movements and radar, which are aspects that influence wind energy development location and planning.
South African National Roads Agency (SANRAL)	This department is responsible for all National road routes.
Department of Agriculture	This department is responsible for agriculture and fishery matters.

At the Provincial Level, the main regulatory agencies are:

Provincial Government of the Eastern Cape – Department of Economic Development and Environmental Affairs (DEDEA)	This Department is responsible for environmental policy and is the Provincial authority in terms of NEMA and the EIA Regulations. The DEDEA is the commenting authority for this project.
Department of Transport and Public Works	This department is responsible for roads and the granting of exemption permits for the conveyance of abnormal loads on public roads.
CapeNature	This Department's involvement relates specifically to the biodiversity and ecological aspects of the proposed development activities on the receiving environment to ensure that developments do not compromise the biodiversity value of an area. The Department considers the significance of impacts specifically in threatened ecosystems as identified by the National Spatial Biodiversity Assessment or systematic biodiversity plans.

At Local Level, the local and municipal authorities are the principal regulatory authorities responsible for planning, land use, and the environment. In the Eastern Cape, both Local Municipalities and District Municipalities play a role. The relevant municipalities include the *Ngqushwa Local Municipality* which forms part of the *Amathole District Municipality*.

» In terms of the Municipal Systems Act (Act No 32 of 2000) it is compulsory for all municipalities to go through an Integrated Development Planning (IDP) process to prepare a five-year strategic development plan for the area under their control.
» Bioregional planning involves the identification of priority areas for conservation and their placement within a planning framework of core, buffer, and transition areas. These could include reference to visual and scenic resources and the identification of areas of special significance, together with visual guidelines for the area covered by these plans.
» By-laws and policies have been formulated by local authorities to protect visual and aesthetic resources relating to urban edge lines, scenic drives, special areas, signage, communication masts, etc.

There are also numerous non-statutory bodies such as the Wind Energy Associations and environmental lobby groups that play a role in various aspects of planning and the environment that will influence wind energy development.

3.3 Legislation that has informed the preparation of this EIA Report

The following legislation and guidelines have informed the scope and content of this EIA Report:

- National Environmental Management Act (Act No 107 of 1998)
- EIA Regulations, published under Chapter 5 of the NEMA (GN R543, GN R544 and GN R546 in Government Gazette 33306 of 18 June 2010)
- Guidelines published in terms of the NEMA EIA Regulations, in particular:
  - Guideline 3: General Guide to Environmental Impact Assessment Regulations, 2006 (DEAT, June 2006)
  - Guideline 4: Public Participation in support of the Environmental Impact Assessment Regulations, 2006 (DEAT, May 2006)
  - Guideline 5: Assessment of alternatives and impacts in support of the Environmental Impact Assessment Regulations, 2006 (DEAT, June 2006)

Acts, standards or guidelines which have informed the project process and the scope of issues assessed within this EIA are summarised in Table 3.1.

Table 3.1: Relevant legislative permitting requirements applicable to the Riverbank Wind Energy Facility

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
National Legislation			
National Water Act (Act No 36 of 1998)	In terms of Section 19, the project proponent must ensure that reasonable measures are taken throughout the life cycle of this project to prevent and remedy the effects of pollution to water resources from occurring, continuing, or recurring.	Department of Water Affairs (as regulator of National Water Act)	No permitting or licensing requirements arise directly by virtue of the proposed project. However, should any rivers or drainage lines need to be crossed then an application will need to be lodged with the Department of Water Affairs.
Environment Conservation Act (Act No 73 of 1989)	National Noise Control Regulations (GN R154 dated 10 January 1992)	National Department of Environmental Affairs;	There is no requirement for a noise permit in terms of the legislation. Noise impacts may result from specific activities carried out during the construction phase of the project and could present an intrusion impact to the local community. Any such specific activities should be limited to 6:00am to 6:00pm Monday – Saturday (excluding public holidays). Should these specific activities need to be undertaken outside of these times, the surrounding communities will need to be notified and appropriate approval will be obtained from the DEA and the Local Municipality.

Minerals and Petroleum Resources Development Act (Act No 28 of 2002)	A mining permit or mining right may be required where a mineral in question is to be mined (e.g. materials from a borrow pit) in accordance with the provisions of the Act. Requirements for Environmental Management Programmes and Environmental Management Plans are set out in Section 39 of the Act.	Department of Minerals and Energy	As no borrow pits are expected to be required for the construction of the facility, no mining permit or right is required to be obtained.
National Environmental Management: Air Quality Act (Act No 39 of 2004)	Sections 18, 19 and 20 of the Act allow certain areas to be declared and managed as "priority areas." Declaration of controlled emitters (Part 3 of Act) and controlled fuels (Part 4 of Act) with relevant emission standards.	National Department of Environmental Affairs	While no permitting or licensing requirements arise from this legislation, this Act will find application during the operational phase of the project. The Act provides that an air quality officer may require any person to submit an atmospheric impact report if there is reasonable suspicion that the person has failed to comply with the Act.
National Heritage Resources Act (Act No 25 of 1999)	Section 38 states that Heritage Impact Assessments (HIAs) are required for certain kinds of development including: » The construction of a road, power line, pipeline, canal or other similar linear development or barrier exceeding 300 m in length; » Any development or other activity which will change the character of a site exceeding 5 000 m2 in extent.	South African Heritage Resources Agency (SAHRA) – National heritage sites (grade 1 sites) as well as all historic graves and human remains.	A permit may be required should identified cultural/heritage sites on site be required to be disturbed or destroyed as a result of the proposed development. Section 4 of the NHRA provides that within 14 days of receipt of notification the relevant Heritage Resources Authority must notify the proponent to submit an impact assessment report if they believe a heritage resource may be affected.

	The relevant Heritage Resources Authority must be notified of developments such as linear developments (such as roads and power lines), bridges exceeding 50 m, or any development or other activity which will change the character of a site exceeding 5 000 m^2; or the re-zoning of a site exceeding 10 000 m^2 in extent. This notification must be provided in the early stages of initiating that development, and details regarding the location, nature and extent of the proposed development must be provided Stand alone HIAs are not required where an EIA is carried out as long as the EIA contains an adequate HIA component that fulfils the provisions of Section 38. In such cases only those components not addressed by the EIA should be covered by the heritage component.		
Nature Conservation Ordinance (Act 19 of 1974)	Article 63 prohibits the picking of certain fauna (including cutting, chopping, taking, and gathering, uprooting, damaging, or destroying). Schedule 3 lists endangered flora and Schedule 4 lists protected flora. Articles 26 to 47 regulate the use of wild animals.	National Department of Environmental Affairs	A permit may be required should it be anticipated that any endangered or protected plant species present on the proposed development site will be disturbed or destroyed as a result of said development.
National Environmental Management: Biodiversity Act (Act No 10 of 2004)	In terms of Section 57, the Minister of Environmental Affairs has published a list of critically endangered, endangered, vulnerable, and protected species in GNR 151 in Government Gazette 29657 of 23 February	National Department of Environmental Affairs	As the applicant will not carry on any restricted activity, as is defined in Section 1 of the Act, no permit is required to be obtained in this regard.

	2007 and the regulations associated therewith in GNR 152 in GG29657 of 23 February 2007, which came into effect on 1 June 2007. In terms of GNR 152 of 23 February 2007: Regulations relating to listed threatened and protected species, the relevant specialists must be employed during the EIA phase of the project to incorporate the legal provisions as well as the regulations associated with listed threatened and protected species (GNR 152) into specialist reports in order to identify permitting requirements at an early stage of the EIA phase. The developer has a responsibility for: » The conservation of endangered ecosystems and restriction of activities according to the categorisation of the area (not just by listed activity as specified in the EIA regulations). Promote the application of appropriate environmental management tools in order to ensure integrated environmental management of activities thereby ensuring that all development within the area are in line with ecological sustainable development and protection of biodiversity. Limit further loss of biodiversity and conserve endangered ecosystems.		A specialist ecological assessment has been undertaken for the proposed project (refer to Appendix E). A permit may be required should any protected plant species on site be disturbed or destroyed because of the proposed development.

Conservation of Agricultural Resources Act (Act No 43 of 1983)	Regulation 15 of GNR1048 provides for the declaration of weeds and invader plants, and these are set out in Table 3 of GNR1048. Declared Weeds and Invaders in South Africa are categorised according to one of the following categories: » Category 1 plants: are prohibited and must be controlled. » Category 2 plants: (commercially used plants) may be grown in demarcated areas providing that there is a permit and that steps are taken to prevent their spread. » Category 3 plants: (ornamentally used plants) may no longer be planted; existing plants may remain, as long as all reasonable steps are taken to prevent the spreading thereof, except within the floodline of watercourses and wetlands. These regulations provide that Category 1, 2 and 3 plants must not occur on land and that such plants must be controlled by the methods set out in Regulation 15E.	Department of Agriculture	While no permitting or licensing requirements arise from this legislation, this Act will find application during the EIA phase and will continue to apply throughout the life cycle of the project. In this regard, soil erosion prevention and soil conservation strategies must be developed and implemented. In addition, a weed control and management plan must be implemented.
National Veld and Forest Fire Act (Act 101 of 1998)	In terms of Section 21 the applicant would be obliged to burn firebreaks to ensure that should a veld fire occur on the property, that it does not spread to adjoining land. In terms of section 12 the applicant must ensure that the firebreak is wide and long enough to have a	Department of Water Affairs	While no permitting or licensing requirements arise from this legislation, this act will find application during the operational phase of the project.

	reasonable chance of preventing the fire from spreading, not causing erosion, and is reasonably free of inflammable material. In terms of section 17, the applicant must have such equipment, protective clothing, and trained personnel for extinguishing fires.		
National Forests Act (Act No 84 of 1998)	Protected trees: According to this act, the Minister may declare a tree, group of trees, woodland or a species as protected. 'No person may cut, damage, disturb, destroy or remove any protected tree, or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a licence granted by the Minister'. Forests: Prohibits the destruction of indigenous trees in any natural forest without a licence.	Department of Water Affairs	A permit or license is required for the destruction of protected tree species and/or indigenous tree species within a natural forest.
Aviation Act (Act No 74 of 1962) 13th amendment of the Civil Aviation Regulations (CARS) 1997	Any structure exceeding 45 m above ground level or structures where the top of the structure exceeds 150 m above the mean ground level, the mean ground level considered the lowest point in a 3 km radius around such structure. Structures lower than 45 m, which are considered as a danger to aviation shall be marked as such when specified. Overhead wires, cables etc., crossing a river, valley, or major roads shall be marked and in addition their supporting towers marked and lighted if an aeronautical study indicates it could constitute a hazard to aircraft.	Civil Aviation Authority (CAA)	This act will find application during the operational phase of the project. Appropriate marking is required to meet the specifications as detailed in the CAR Part 139.01.33. Furthermore an obstacle approval will be required for each turbine.

	Section 14 of Obstacle limitations and marking outside aerodrome or heliport – CAR Part 139.01.33 relates specifically to appropriate marking of wind energy facilities.		
Hazardous Substances Act (Act No 15 of 1973)	This Act regulates the control of substances that may cause injury, or ill health, or death because of their toxic, corrosive, irritant, strongly sensitising, or inflammable nature or the generation of pressure thereby in certain instances and for the control of certain electronic products. To provide for the rating of such substances or products in relation to the degree of danger; to provide for the prohibition and control of the importation, manufacture, sale, use, operation, modification, disposal or dumping of such substances and products. Group I and II: Any substance or mixture of a substance that might by reason of its toxic, corrosive etc, nature or because it generates pressure through decomposition, heat or other means, cause extreme risk of injury etc., can be declared to be Group I or Group II hazardous substance; Group IV: any electronic product; Group V: any radioactive material. The use, conveyance, or storage of any hazardous substance (such as distillate fuel) is prohibited without an appropriate license being in force.	Department of Health	It is necessary to identify and list all the Group I, II, III, and IV hazardous substances that may be on the site and in what operational context they are used, stored or handled. If applicable, a license is required to be obtained from the Department of Health.
National Environmental Management: Waste Act (Act No 59) of 2008	The Minister may by notice in the *Gazette* publish a list of waste management activities that have, or are likely to have, a detrimental	National Department of Environmental Affairs.	The volumes of waste generated during construction and operation of the facility will not be large enough to

	effect on the environment. The Minister may amend the list by: » Adding other waste management activities to the list; » Removing waste management activities from the list; or 55; » Making other changes to the particulars on the list.		require a waste license.
National Road Traffic Act (Act No 93 of 1996)	The Technical Recommendations for Highways (TRH 11): "Draft Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and for other Events on Public Roads" outline the rules and conditions which apply to the transport of abnormal loads and vehicles on public roads and the detailed procedures to be followed in applying for exemption permits are described and discussed. Legal axle load limits and the restrictions imposed on abnormally heavy loads are discussed in relation to the damaging effect on road pavements, bridges, and culverts. The general conditions, limitations, and escort requirements for abnormally dimensioned loads and vehicles are also discussed and reference is made to speed restrictions, power/mass ratio, mass distribution, and general operating conditions for abnormal loads and vehicles. Provision is also made for the granting of permits for all other exemptions from the requirements of	Provincial Department of Transport (provincial roads), and South African National Roads Agency Limited (national roads)	An abnormal load/vehicle permit may be required to transport the various components to site for construction. These include: » Route clearances and permits will be required for vehicles carrying abnormally heavy or abnormally dimensioned loads. » Transport vehicles exceeding the dimensional limitations (length) of 22 m. » Depending on the trailer configuration and height when loaded, some of the power station components may not meet specified dimensional limitations (i.e. height and width).

	the National Road Traffic Act and the relevant Regulations.		
Development Facilitation Act (Act No 67 of 1995)	Provides for the overall framework and administrative structures for planning throughout the Republic. Sections 2 - 4 provide general principles for land development and conflict resolution.	Provincial Environmental Department - commenting authority, and Local Municipality, District Municipality	The applicant must submit a land development application in the prescribed manner and form as provided for in the Act. A land development applicant who wishes to establish a land development area must comply with procedures set out in the DFA.
Subdivision of Agricultural Land Act (Act No 70 of 1970)	Details land subdivision requirements and procedures. Applies for subdivision of all agricultural land.	Provincial Environmental Department - commenting authority and Local Municipality, District Municipality	Subdivision will have to be in place prior to any subdivision approval in terms of Section 24 and 17 of LUPO. Subdivision is required to be undertaken following the issuing of an environmental authorisation for the proposed project.
Promotion of Access to Information Act (Act No 2 of 2000)	All requests for access to information held by state or private body are provided for in the Act under S11.	National Department of Environmental Affairs.	No permitting or licensing requirements. This act may find application during through the project EIA.
Promotion of Administrative Justice Act (Act No 3 of 2000)	In terms of Section 3 the government is required to act lawfully and take procedurally fair, reasonable, and rational decisions. Interested & affected parties have right to be heard.	National Department of Environmental Affairs.	No permitting or licensing requirements. This act will find application during through the project EIA.

Provincial Legislation			
Eastern Cape Land Use Planning Ordinance 15 of 1985	Details land subdivision and rezoning requirements and procedures.	Eastern Cape Department of Environmental Affairs and Development Planning; and Local authorities	Given that the wind energy development is proposed on land that is zoned for agricultural use, a rezoning application in terms of Section 17 of LUPO to an alternative appropriate zone will be required. It is anticipated that the wind energy development would require a rezoning to either Industrial Zone 14 or Special Zone5 as defined in the Scheme Regulations in terms of Section 8 of LUPO (Government Gazette, December 1988). Rezoning is required to be undertaken following the issuing of an environmental Authorisation for the proposed project.

[4] "Industry: means an enterprise defined in the regulations made in terms of Section 35 of the Machinery and Occupational Safety Act (Act 6 of 1983)" (note, these Regulations include any 'electrical installation')."

[5] "Special Usage: means a use which is such, or in respect of which the land use restrictions are such, that it is not catered for in these regulations, and which is set out in detail by means of conditions of approval, or by means of conditions applicable to the special zone."

APPROACH TO UNDERTAKING THE EIA PROCESS CHAPTER 4

An EIA refers to that process (dictated by the EIA Regulations) which involves the identification of and assessment of direct, indirect, and cumulative environmental impacts associated with a proposed project. The EIA process comprises two phases: **Scoping phase** and **EIA phase**. The EIA process culminates in the submission of an EIA report (including an environmental management plan (EMP)) to the competent authority for decision-making. The EIA process is illustrated below:

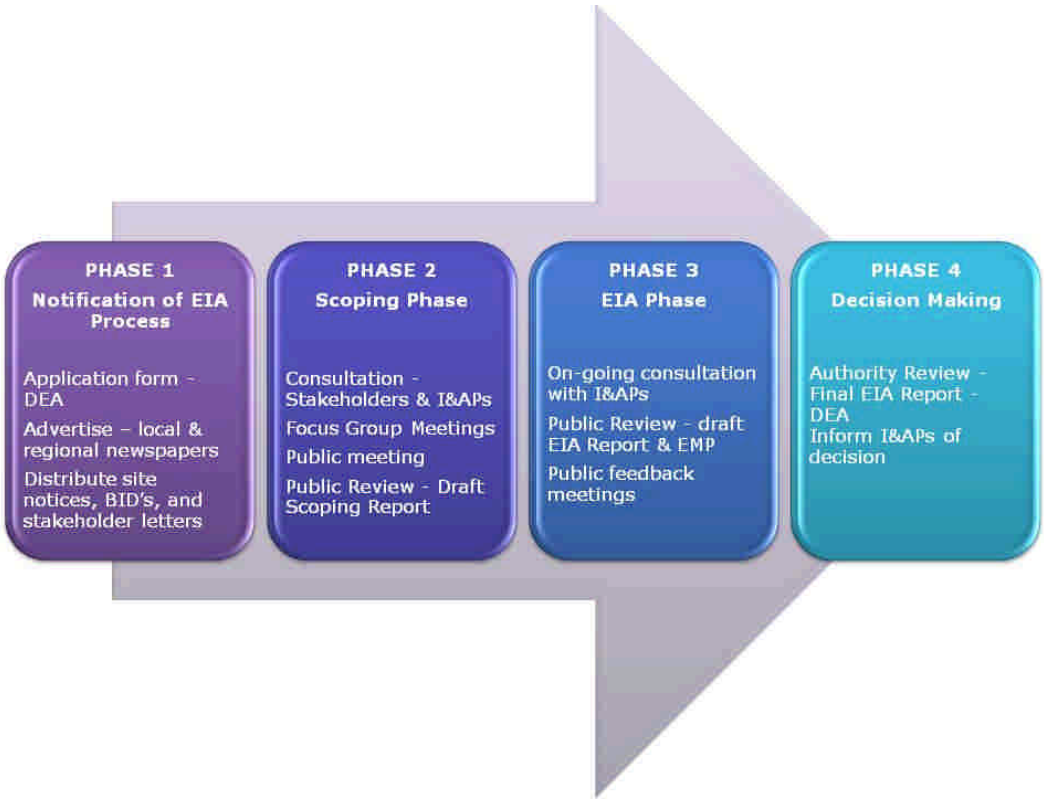


Figure 4.1: Phases included within an EIA process

Note: This EIA process is being conducted in accordance EIA Regulations that were current at the time of application for authorisation (i.e. the EIA Regulations of April 2006). The environmental studies for this proposed project were undertaken in two phases, in accordance with the EIA regulations.

4.1 Phase 1: Scoping Phase

The Scoping study, which commenced in May 2010, provided I&APs with the opportunity to receive information regarding the proposed project, participate in the process and raise issues of concern.

The Scoping report aimed at detailing the nature and extent of the proposed facility, identifying potential issues associated with the project, and defining the extent of studies required within the EIA. This was achieved through an evaluation of the proposed project, involving the project proponent, specialist consultants, and a consultation process with key stakeholders that included both relevant government authorities and interested and affected parties (I&APs). In accordance with the requirements of the EIA Regulations, feasible project-specific alternatives (including the "do nothing" option) were identified for consideration within the EIA process.

The draft Scoping report was made available at public places for I&AP review and comment. All the comments, concerns, and suggestions received during the Scoping phase and the review period were included in the final Scoping report and plan of study for EIA. The final Scoping report and Plan of Study for the EIA phase was submitted to the National Department of Environmental Affairs (DEA), and was accepted in August 2010 (refer to authority correspondence included in Appendix B). In terms of this acceptance, an EIA was required to be undertaken for the proposed project.

4.2 Phase 2: EIA Phase

Through the Scoping Phase, although no environmental fatal flaws were identified, and no absolute 'no-go' areas were identified, a number of **potentially sensitive areas** were identified. These included areas along natural drainage lines; areas along steep slopes; potentially sensitive noise receptors within the study area; and potential heritage sites within the area. A number of issues and potentially sensitive areas requiring further study for both the wind energy facility development site as well as the associated infrastructure were highlighted. These issues have been assessed in detail within the EIA Phase of the process (refer to Chapter 6).

The EIA phase aimed to achieve the following:

» Provide an overall assessment of the social and biophysical environments affected by the proposed project.
» Assess potentially significant impacts (direct, indirect, and cumulative, where required) associated with the proposed wind energy facility and associated infrastructure.
» Identify and recommend appropriate mitigation measures for potentially significant environmental impacts.
» Undertake a fully inclusive public involvement process to ensure that I&AP are afforded the opportunity to participate in the EIA process, and that their issues and concerns are recorded.

The EIA addresses potential environmental impacts and benefits (direct, indirect, and cumulative impacts) associated with all phases of the project including design, construction, and operation and decommissioning, and aims to provide the environmental authorities with sufficient information to make an informed decision regarding the proposed project. The EIA process followed for this project is described below.

The EIA phase has been undertaken in accordance with the EIA Regulations published in Government Notice 28753 of 21 April 2006, in terms of NEMA. Key tasks undertaken within the EIA phase included:

» Consultation with relevant decision-making and regulating authorities (at National, Provincial and Local levels).
» Undertaking a public involvement process throughout the EIA process in accordance with Regulation 56 of Government Notice No R385 of 2006 in order to identify any additional issues and concerns associated with the proposed project.
» Preparation of a Comments and Response report detailing key issues raised by I&APs as part of the EIA Process (in accordance with Regulation 59 of Government Notice No R385 of 2006).
» Undertaking of independent specialist studies in accordance with Regulation 33 of Government Notice No R385 of 2006.
» Preparation of this Final EIA Report in accordance with the requirements of the Regulation 32 Government Notice No R385 of 2006.

These tasks are discussed in detail below.

4.3 Authority Consultation

Consultation with the regulating authorities (i.e. DEA & DEDEA) and Organs of State which have jurisdiction in respect of the activity to which the application relates has continued throughout the EIA process. On-going consultation includes the following:

» Submission of a Final Scoping report (July 2010) following a 30-day public review period (and consideration of stakeholder comments received).
» Following the submission of this Final EIA Report an opportunity will be provided for DEA and DEDEA representatives to visit and inspect the proposed site.

The following was undertaken as part of this EIA process:

» Submission of a Final EIA report to DEA following the 30-day public review period.
» Consultation with Organs of State that may have jurisdiction over the project:
  * National, provincial, and local government departments (including DEA, DEDEA, South African Heritage Resources Association, Eastern Cape Department of Land Affairs and Rural Development, Department of Agriculture, Department of Water

Affairs, South African National Roads Agency Limited, Eastern Cape Department of Roads and Transport, Department of Public Works, Department of Mineral Resources.)

* Ngqushwa Local Municipality
* Amathole District Municipality

A record of all authority consultation undertaken prior to the commencement of the EIA Phase was included within the Scoping Report. A record of the consultation in the EIA Phase is included within Appendix B. Following the completion of the 40 day comment period for the Draft EIA Report by organs of state, comments were requested from the relevant organs of state. The following summarises which Organs of State have been involved in the process..

Organ of State	**Notes**
Ngqushwa Local Municipality	A copy of the Draft EIA Report was couriered to the municipality and a meeting was held at the local municipality's premises on 25 January 2011 (please refer to the Comments and Response Report). The attendees were advised that additional comments/queries could be submitted following the meeting. No additional comments have been received to date.
Amathole District Municipality	A copy of the Draft EIA Report was couriered to the municipality and a meeting was held at the district municipality's premises on 26 January 2011 (please refer to the Comments and Response Report). The attendees were advised that additional comments/queries could be submitted following the meeting. No additional comments have been received to date.
Eastern Cape Department of Economic Development and Environmental Affairs	A copy of the Draft EIA Report was couriered to Briant Noncembu, who was contacted for comment but none was received (refer to Appendix B2).
Eastern Cape Department of Agriculture and Land Affairs	A copy of the Draft EIA Report was couriered to Advocate Amon Nyondo. Comment was requested from the Department on several occasions telephonically. Several individuals were contacted requesting written comments, including Ruth Mansi and Lourens Msisi. No comments have been received to date.
Eastern Cape Department of Water Affairs	A copy of the Draft EIA Report was couriered to and received by Andrew Lucas who was contacted telephonically for comment. Mr Lucas confirmed that the department had no comments and would send an email in that regard, however none was received.
South African Heritage Resources Agency	A copy of the Draft EIA Report was couriered to and received by Mariagrazia Galimberti, and comment was received on 18 February 2011 (refer to Appendix B1).
Department of Roads and Public Works	Comment was originally received from this Department in August 2010. Further comment was requested however none has been received to date (refer to Appendix E).

4.3.1 Public Involvement and Consultation: EIA Phase

The public involvement process was initiated at the start of the EIA process and has continued throughout the Scoping and EIA Phases. The aim of the public participation process was primarily to ensure that:

» Information containing all relevant facts in respect of the proposed project was made available to potential stakeholders and I&APs.
» Community/public meetings were held in Xhosa.
» Participation by potential I&APs was facilitated in such a manner that all potential stakeholders and I&APs were provided with a reasonable opportunity to comment on the proposed project.
» Comment received from stakeholders and I&APs was recorded, considered, and incorporated into the EIA process.

Through on-going consultation with key stakeholders and I&APs, issues raised through the Scoping Phase for inclusion within the EIA Phase were confirmed. All relevant stakeholder and I&AP information has been recorded within a database of affected parties (refer to Appendix C for a listing of recorded parties). While I&APs were encouraged to register their interest in the project from the onset of the process, the identification and registration of I&APs has been on-going for the duration of the EIA process and the project database has been updated on an on-going basis. Refer to Appendix C for a landowner map which indicates the surrounding landowners that have been notified throughout the EIA Process.

The following variables were considered in the decision regarding the level of public participation required for the EIA phase as well as the process to be followed:

» *The public sensitivity and the degree of controversy of the project:* the project concept (wind energy facilities) is new to South Africa, and has had both positive and negative exposure.
» *The nature of the potentially affected parties:* the communities that may be affected are predominantly of a rural nature, many of whom are not literate or do not speak English. Therefore the approach to the public participation has been to introduce and give details of the project to the community in a simplified manner whilst remaining transparent and accurate in the delivering of project specific information.

In order to accommodate the varying needs of stakeholders and I&APs, as well as ensure the relevant interactions between stakeholders and the EIA specialist team, the following opportunities have been provided for I&APs issues to be recorded and verified through the EIA Phase, including:

» Focus group meetings (pre-arranged and stakeholders invited to attend)
» One-on-one consultation meetings and telephonic consultation sessions (consultation with various parties, for example with directly affected landowners and local

municipalities, by the project participation consultant as well as specialist consultants)
» Written, faxed or e-mail correspondence.
» Stakeholder and community meetings (held during the review period of the Draft EIA Report).

Date	Venue	Ward/Area	Attendees
25 January 2011	Peddie Local Municipality, Main Road, Peddie	Peddie Local Municipality	Mr Badi - Executive Manager Infrastructure,
25 January 2011	Wesley Community Hall	Wesley, Gcinisa, Emthana	General community
25 January 2011	Emthana Village Hall	Emthana Village	Focus Group Landowners
25 January 2011	Sandcastle Villa	New Bradford Farm	Craig Willemse (manager)
26 January 2011	Caxton House, Caxton Street, East London	Amathole District Municipality Offices	Economic Department Director, Amathole District Municipality
26 January 2011	Hamburg Community Hall	Hamburg Village	General community
26 January 2011	Bodium Primary School	Bodium Village	General community
27 January 2011	Bell Community Hall	Bell Village	General community

4.3.2 Identification and Recording of Issues and Comments

Issues and comments raised by I&APs over the duration of the EIA process have been synthesised into Comments and Response reports (refer to Appendix D for the Comments and Response reports compiled from both the Scoping and EIA Phases).

The Comments and Response Reports include responses from members of the EIA project team and/or the project proponent. Where issues are raised that the EIA team considers beyond the scope and purpose of this EIA process, clear reasoning for this view is provided.
Several issues of concern have been raised to date and include amongst others, the following:

Social impacts
» Health and safety
» Potential noise and visual impacts
» Impacts on tourism and land values

» Provision of alternative grazing
» Impacts on heritage resources
» The role and importance of public participation
» Employment opportunities
» Skills development
» Influx of jobseekers
» Operating mechanism for the Cooperative Agreement
» Integration of the facility with the Eskom grid
» Recourse for the communities

Biophysical impacts

» Ecology impacts including avifauna, bats, wetland species, and endangered tree species

4.3.3 Assessment of issues identified through the scoping process

Based on the findings of the Scoping study, the following issues required further investigation within the EIA phase (refer to Table 4.1).

Table 4.1: Specialist studies undertaken within the EIA phase

Specialist	Area of Expertise	Appendix
David Hoare Consulting	Ecological impact assessment	Appendix E
Avisense Consulting	Avifauna impact assessment	Appendix F
Outeniqua Geotechnical Services	Geology, soils & erosion potential study	Appendix G
Albany Museum	Heritage impact assessment	Appendix H
Albany Museum	Palaeontological impact assessment	Appendix I
MetroGIS	Visual impact assessment	Appendix J
MENCO	Noise impact assessment	Appendix K
Tony Barbour Environmental Consulting and Research	Social impact assessment	Appendix L

Specialist studies considered direct and indirect environmental impacts associated with the development of the proposed facility and all associated infrastructure (including different options with regards to site design and layout), as well as the options for the alignments/corridors of the proposed power line.

Issues were assessed in terms of the following criteria:

- The **nature**, a description of what causes the effect, what will be affected, and how it will be affected.
- The **extent**, wherein it is indicated whether the impact will be local (limited to the immediate area or site of development), regional, national or international. A score of between 1 and 5 is assigned as appropriate (with a score of 1 being low and a score of 5 being high).
- The **duration**, wherein it is indicated whether:
  - The lifetime of the impact will be of a very short duration (0–1 years) – assigned a score of 1;
  - The lifetime of the impact will be of a short duration (2-5 years) - assigned a score of 2;
  - Medium-term (5–15 years) – assigned a score of 3;
  - Long term (> 15 years) - assigned a score of 4; or
  - Permanent - assigned a score of 5.
- The **magnitude**, quantified on a scale from 0-10, where a score is assigned:
  - 0 is small and will have no effect on the environment;
  - 2 is minor and will not result in an impact on processes;
  - 4 is low and will cause a slight impact on processes;
  - 6 is moderate and will result in processes continuing but in a modified way;
  - 8 is high (processes are altered to the extent that they temporarily cease); and
  - 10 is very high and results in complete destruction of patterns and permanent cessation of processes.
- The **probability** *of occurrence*, which describes the likelihood of the impact actually occurring. Probability is estimated on a scale, and a score assigned:
  - Assigned a score of 1–5, where 1 is very improbable (probably will not happen);
  - Assigned a score of 2 is improbable (some possibility, but low likelihood);
  - Assigned a score of 3 is probable (distinct possibility);
  - Assigned a score of 4 is highly probable (most likely); and
  - Assigned a score of 5 is definite (impact will occur regardless of any prevention measures).
- The **significance**, which is determined through a synthesis of the characteristics described above (refer formula below) and can be assessed as low, medium or high.
- The **status**, which is described as positive, negative, or neutral.
- The degree to which the impact can be reversed.
- The degree to which the impact may cause irreplaceable loss of resources.
- The *degree* to which the impact can be *mitigated.*

The **significance** is determined by combining the criteria in the following formula:

S= (E+D+M) P; where

S = Significance weighting
E = Extent
D = Duration
M = Magnitude
P = Probability

The **significance weightings** for each potential impact are as follows:

» **< 30 points:** Low (i.e. where this impact would not have a direct influence on the decision to develop in the area),
» **30-60 points:** Moderate (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated),
» **> 60 points:** High (i.e. where the impact must have an influence on the decision process to develop in the area).

As Just Energy has the responsibility to avoid or minimise impacts and plan for their management (in terms of the EIA Regulations), the mitigation of significant impacts is discussed. Assessment of impacts with mitigation is made in order to demonstrate the effectiveness of the proposed mitigation measures. A draft Environmental Management Plan (EMP) is included as Appendix M. The specialist EIA studies are contained within Appendices E - L.

4.3.4 Public Review of Draft EIA Report

The Draft EIA Report was made available for public review from **24 January 2011 to 22 February 2011** at the following locations:

» Ngqushwa Local Municipality
» Amathole District Municipality
» Wesley Clinic
» www.savannahsa.com

All registered I&APs were notified of the availability of the EIA Report through stakeholder letter (refer to Appendix D2). In addition, newspapers advertisements were placed in the Daily Dispatch (English) and the Pondo News (Xhosa) on 24 and 21 of January 2011 respectively (refer to Appendix D for placement proof of the adverts).

In order to facilitate comments on the Draft EIA Report and provide feedback of the findings of the studies undertaken, public/community meetings as well as focus group meetings with stakeholders were held during the review period.

4.4 Assumptions, Limitations and Gaps in Knowledge

Wind energy facilities are a new development type in South Africa and, to date, have not been implemented on a large scale. Therefore certain gaps in knowledge, assumptions, and uncertainties which are likely to occur during the EIA process are discussed below.

In conducting this EIA process, the following general assumptions have been made:

» The motivation as to the selection of the proposed development site (including details pertaining to the wind resource etc.) provided by Just Energy is sufficient and defendable.
» Only one site is available for the establishment of the proposed facility and will be considered in the EIA, and no other sites are available to be included as alternative sites in the EIA. This is based on the detailed wind analysis (with specific measurements on site) which has been done to date as well as on land availability, access to the site, grid connectivity, etc.
» It is assumed that the development site identified by Just Energy represents a technically suitable site for the establishment of a wind energy facility and associated infrastructure.
» The EIA study was conducted based on a preliminary layout of the wind energy facility provided by Just Energy. It is understood that this layout is preliminary at this stage of the project development cycle, and it is assumed that the layout is approximately 80% accurate, and subject to some change.

DESCRIPTION OF THE AFFECTED ENVIRONMENT CHAPTER 5

This chapter provides a description of the environment that may be affected by the proposed Riverbank Wind Energy Facility. Aspects of the biophysical, social, and economic environment that could directly or indirectly be affected by, or could affect the proposed development have been described. This information has been sourced from both existing information available for the area and the proposed development site, as well as field data, and aims to provide the context within which the environmental assessment has been conducted. A more detailed description of each aspect of the affected environment is included within the specialist reports contained within Appendices E - L.

5.1 Regional Setting

The majority of the study area is natural, although parts are degraded to varying degrees through land-use practices. The landscape consists primarily of communal land used as rangeland for subsistence livestock production. Subsistence farming systems are characterised by land stocked at above economically sustainable levels. These regions have been communally farmed for close to 100 years. Degradation of grasslands under these conditions has been blamed on high stocking rates of domestic livestock and a lack of rotation. Degradation due to overgrazing is evident in the amount and type of vegetation cover.

There are a number of cultivated lands on site and are probably cultivated on a shifting or rotational basis. According to land type information, the soils on site are considered marginal for cultivation, despite the adequate rainfall. The cultivated lands are concentrated in two places, along the northern border of the site and within the southern one third of the site closest to the coast.

5.2 Climatic Conditions

The climate for the study area is mild and temperate, with warm summers and mild winters. Midday temperatures typically range from 15 °C to 25 °C as the proximity of the coast ameliorates potential climatic extremes.

Strong bimodal patterns of rainfall exist in the study area with a high proportion of spring and autumn rainfall and a mean annual rainfall of ~630 mm. The study area has high lightning flash densities, which increases the likelihood of lightning-induced fire.

The Eastern Cape experiences persistent north-westerly winds throughout the year. These winds are responsible for bringing dry heat which can have a severe desiccating effect on exposed vegetation. In contrast, cold, moist, south-easterly winds blow occasionally in summer with the occurrence of northerlies, mostly in summer, which bring thunderstorms by advecting moist tropical air. Winter cold fronts bring cold, sometimes dry winds to the Province.

The wind rose indicates the annual frequencies of winds blowing from a given direction. The power rose indicates the annual power associated with winds blowing from a given direction. Each concentric band indicates a 10% incidence in each directional sector. The wind rose demonstrates that the annual pre-dominant winds are from the east-north-east and west.

Figure 5.1: The *wind rose* (left) and *power rose* (right) for the identified development site

5.3 Geological and Topographic Profile

The topography of the study area comprises a gently undulating central upland area, which trends northeast-southwest. The northern slopes drain into tributaries of the Keisikamma River and the southern slopes drain into the Ngculura River, Blue Krans Stream and Mtana River. The altitude range for the study area is 139m to 20m amsl.

The western portion of the site is underlain by Middleton Formation and the eastern portion of the study area is underlain by Balfour Formation. Both formations are members of the Adelaide Subgroup (late Permian age) of the Karoo Supergroup. The Balfour Formation overlies the Middleton Formation and both formations consist of alternating grey, moderately to well-sorted, fine to very fine-grained sandstones and

bluish grey, greenish grey or greyish-red mudstones. Sandstone generally forms 20-30% of the total package. The strata dip gently to the northeast at an angle of 20°. Topographic high-points (koppies) are capped with Nanaga Formation aeolian sand of Pliocene to Early Pleistocene age (~2Ma). There are no faults mapped in the immediate vicinity of the site. Observations made on site indicate that the majority of the site above the 100m contour line is underlain by cohesionless aeolian sand deposits of the Nanaga Formation. The spatial distribution of these sands is far wider than indicated on the official published geological map for the area. Areas below the 100m contour are covered by thin transported soil underlain by residual soil horizon of unknown thickness. The areas underlain by thick deposits of sand (upland areas of higher relief) are distinguished by the presence of numerous termite mounds. The mounds tend to be scarce on the lowland flats.

Significant informal digging activity has taken place on Sandflat 149 which, as the name infers, has exploited thick sand deposits of the Nanaga Formation. The sand is most likely being used for construction purposes (i.e. building sand). The expected surficial soil types above the 100m contour line is light brown, cohesionless, slightly silty sands of unknown thickness (likely to be between 1-6m in thickness). Below this altitude, there is likely to be a thinner horizon of silty sand, reworked from the slopes above, overlying residual soil (weathered sandstone and mudstone). Detailed geotechnical investigations will provide more accurate information in this regard.

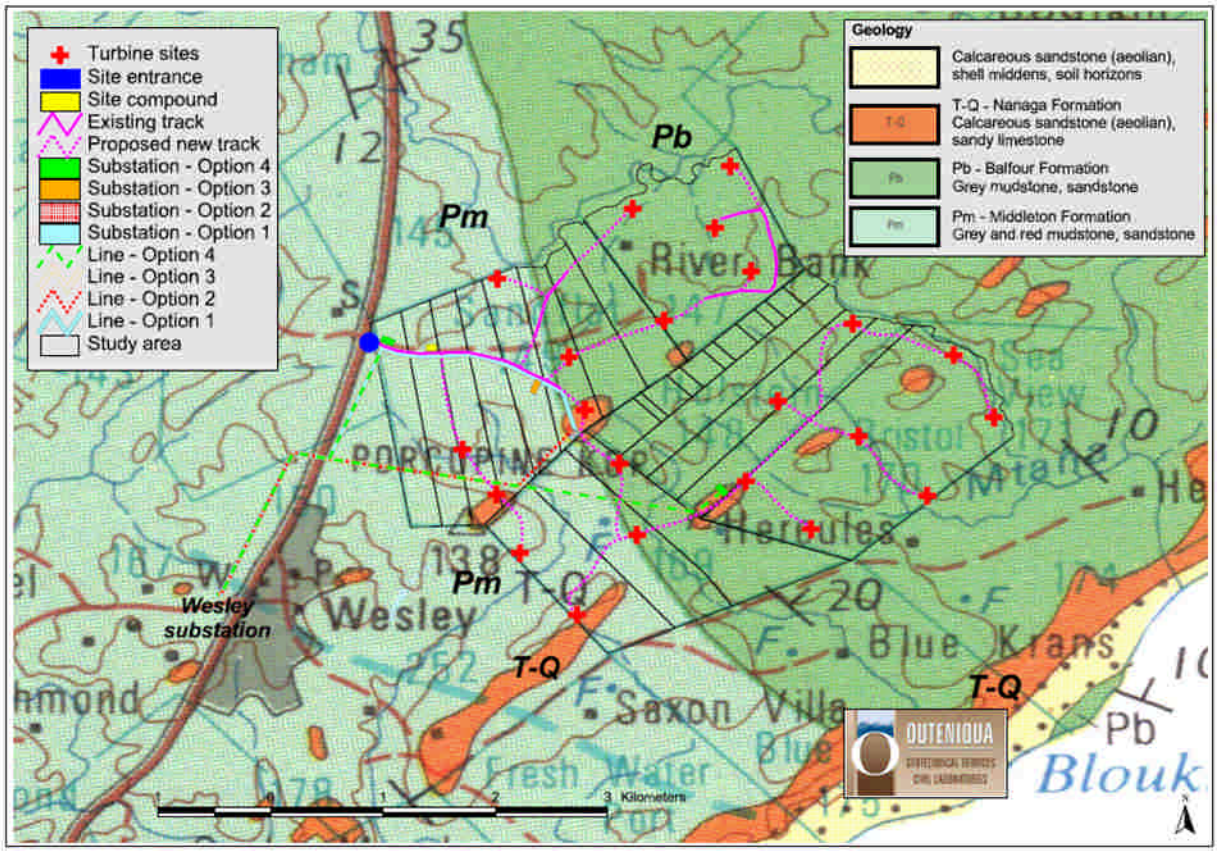


Figure 5.2: Geological map of the study area.

The study area lies in the Keisikamma Primary Catchment area (DWAF code R). The northern slopes drain into tributaries of the Keisikamma River (R1 secondary catchment) and the southern slopes drain into the Ngculura River, Blue Krans Stream, and Mtana River (R2 secondary catchment).

The mean annual precipitation is moderate to high (~630mm) and heavy downpours are commonplace in this area. The anticipated soil infiltration rates are high in areas underlain by Nanaga Formation sands, but low elsewhere. In areas of lower infiltration, higher run-off is expected during periods of high rainfall intensity. The study area is generally drained well owing to the topography and the run-off is collected in well-defined natural drainage lines. High velocity run-off into drainage lines has implications for erosion potential along these lines.

5.4 Agricultural Potential

The area is underlain by mudstone and sandstone of the Adelaide Formations (in the west) and Balfour Formations (in the east) and formations of the Beaufort Group, with some overlaying by coastal sands in places). The study area is covered by two land types, namely **Fa 1047** (Shallow soils, usually non-calcareous); and **Hb132** (Grey sandy soils) (refer to Table 5.1 and Figure 5.2).

Table 4.1: Land types occurring within the study site (with soils in order of dominance)

Land Type	Dominant Soils	Depth (mm)	Land Type	Characteristics	Agricultural Potential
Fa1047	Glenrosa 16 + Cartref 11	300-600	58%	Grey-brown, loamy topsoils on brown to grey, gravelly loamy subsoils on weathering rock	High:9.5% Mod: 12.5% **Low: 78.0%**
	Kroonstad 13/16	400-800	12%	Grey-brown, loamy topsoils on grey, loamy subsoils on clay	
Hb132	Vilafontes 23 + Fernwood 20	>1200	44%	Grey to yellow-brown, sandy to loamy soils	High:44.0% **Mod: 45.5%** Low: 10.5%
	Hutton 26/36	>1200	19%	Red, sandy to loamy soils	

As can be seen from the information contained in the table, only land type Hb132 contains a significant proportion of soils with high agricultural potential which, although sandy, are deep. Much of the study area consists of shallow lithosols (Glenrosa, Cartref) of low agricultural potential, or rock.

Due to the average rainfall in the area, there is potential for arable agriculture in the area although the sandy soils may be prone to drought. The shallower soils are suited for grazing at best (the grazing capacity of the area is moderately low, around 10-14 ha/large stock unit).

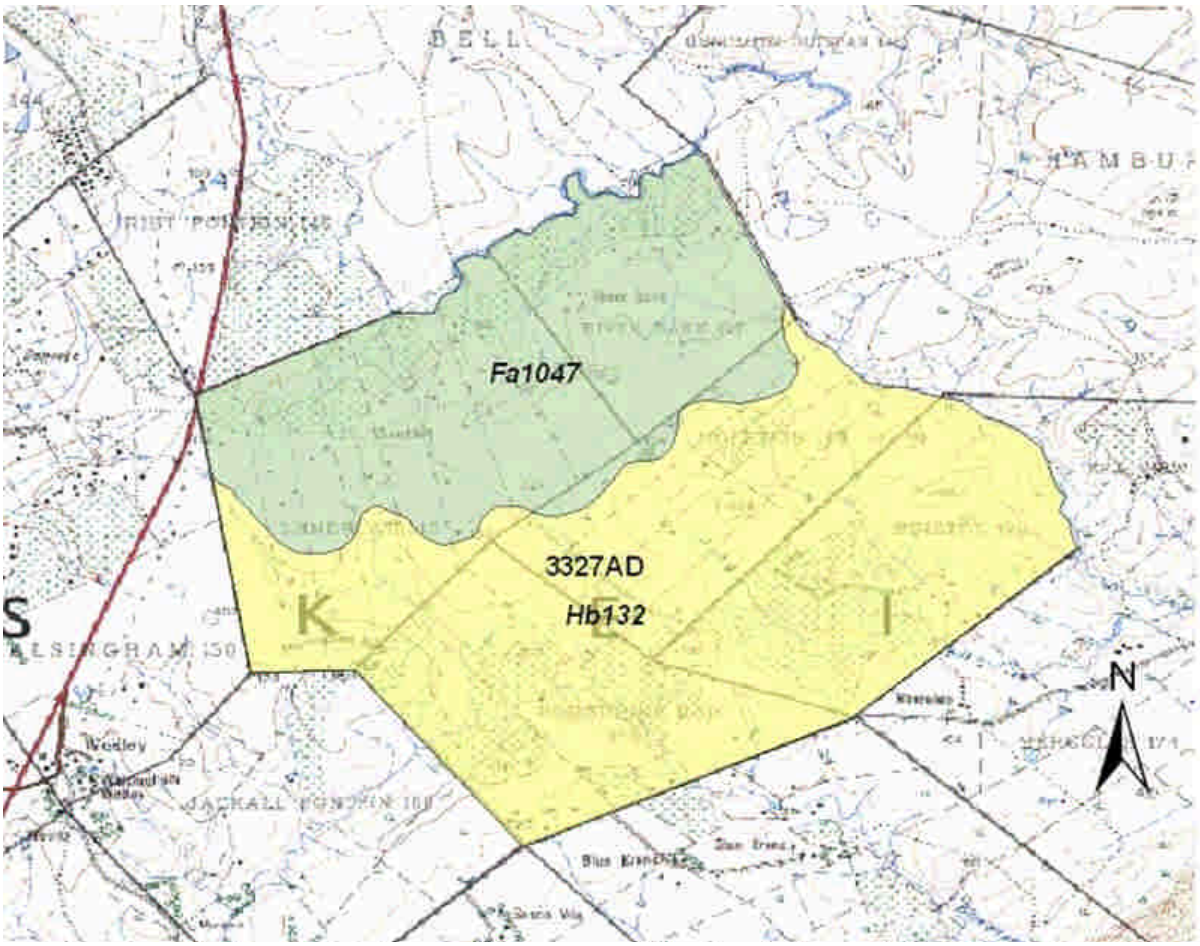


Figure 5.3: Soil types identified for the study area

5.5 Ecological Profile

The study area falls within the Albany Coastal Belt, which falls into the Albany Thicket Biome (refer to Figure 5.4). This vegetation type is found on gently to moderately undulating landscapes and dissected hilltop slopes primarily within 15 km of the Indian Ocean coastline from the Kei River to the Sundays River. The vegetation type is considered part of a mosaic of a wide variety of structural vegetation types, ranging from grassland to forest which reflects post-disturbance succession gradients as well as

natural variation in geology, soil patterns, and distribution of water within the landscape. This vegetation type occurs on all the farms under assessment.

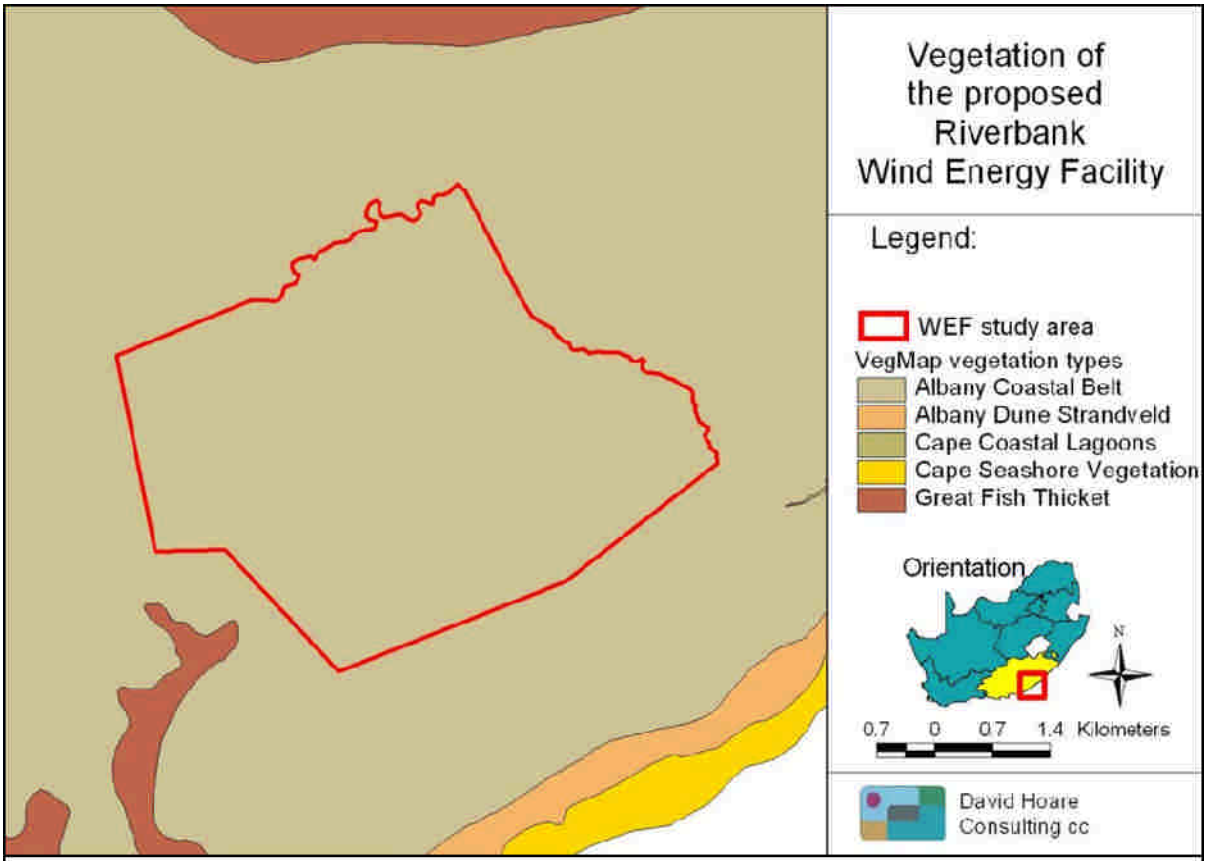


Figure 5.4: Vegetation types within the study area

The vegetation type occurring in the study area is classified as Least Threatened based on rates of transformation (i.e. moderate at 19%) and conservation (i.e. not very high at 1%). The vegetation type is primarily utilised in its natural state to support communal livestock farming, and there is no immediate threat of transformation to another landcover type in which natural vegetation is not supported. Despite the low levels of potential transformation, rates of degradation may be relatively high. Existing degradation due to overgrazing is evident in the amount and type of vegetation cover.

5.5.1 Red Data Species

Plants - two plant species of minor conservation concern have a probability of occurring on site include *Wahlenbergia kowiensis* (Rare), and *Eulophia speciosa* (Declining).

Mammals - the White-tailed Rat, the Samango Monkey, and the Giant golden Mole, are all classified as endangered mammals that could occur in available habitats in the study area. The Brown Hyena, the Natal Long-fingered Bat, and the Cape Horseshoe Bat could also occur within habitat types in the study area and are classified as Near Threatened. Several other bat species are classified as Threatened / Near Threatened with respect to

their South African Range. These include Swinny's Horseshoe Bat, Lesser Woolly Bat, Lesser Long-fingered Bat, Temminck's Hairy Bat, Darling's Horseshoe Bat, and Geoffrey's Horseshoe Bat. The remaining mammal species with a geographical distribution that includes the region were assessed as having a low chance of occurring in available habitats in the study area (i.e. by virtue of the site being at the margin of their distribution range).

Amphibians and reptiles - the Eastern Leopard Toad which is classified as Declining is the only frog species that could occur on site. A species classified as such does not fall within the Threatened category and is therefore of lesser conservation concern. The African Rock Python (Vulnerable) and the Yellow-bellied House Snake (Near Threatened) have a distribution that includes the study area and which could occur on site.

Fish - The Freshwater Mullet which is classified as Declining as previously been recorded in the grid in which the study area is located and therefore has a high likelihood of occurring in the estuary downstream of the site.

5.5.2 Protected Trees

Several tree species which are protected under the National Forest Act (Act No. 84 of 1998) have a geographical distribution that includes the study area (refer to Appendix E). These include the Coastal Red Milkwood, the Assegai Tree, Black Stinkwood, Cape Cheesewood, False Yellowwood, Real Yellowwood, African Plum Tree, and White Milkwood. Based on habitat preferences, the two species most likely to occur on or near the site are the Coastal Red Milkwood and the White Milkwood, both of which have been previously recorded in the grid in which the study site is located. If either of these species occurs in the study area, the most likely places would be in the thicket in the drainage lines. The evergreen Cheesewood could occur in any dense woodland in the study area, especially with any thicket vegetation that may occur in the southern parts of the study area.

5.5.3 Features of Conservation Concern

Features of conservation concern within the study site can be identified by examining a number of regional conservation assessments[6] produced within the Eastern Cape Province, including Subtropical Thicket Ecosystem Programme (**STEP**); Succulent Karoo Ecosystems Programme (**SKEP**); National Spatial Biodiversity Assessment (**NSBA**); and

[6] These studies identify patterns and processes that are important for maintaining biodiversity in the region. Unfortunately, many of these studies have been done using coarse scale satellite imagery that does not provide spatial or spectral accuracy at the scale of the present study. They are, however, useful for understanding broad issues and patterns within the area.

Eastern Cape Biodiversity Conservation Plan (**ECBCP**)[7]. The ECBCP identifies Critical Biodiversity Areas (CBAs) (refer to Figure 5.5), which identify terrestrial/aquatic features in the landscape that are critical for conserving biodiversity and maintaining ecosystem functioning. The ECBCP identifies CBAs at different levels with decreasing biodiversity importance, as follows (for the study area and surroundings):

» PA: Protected areas.
» CBA 1: Critical vegetation types and irreplaceable biodiversity areas (areas definitely required to meet conservation targets).
» CBA 2: Endangered vegetation types, ecological corridors, forest patches that do not fall into CBA 1, 1 km coastal buffer, irreplaceable biodiversity areas that do not fall into CBA 1.
» CBA 3: Vulnerable vegetation types.

The ECBCP identifies CBAs at two levels that occur within the study area and surroundings. The CBA 2 areas that fall within the study site are corridor areas, which are important for a number of reasons, including the maintenance of ecological processes. The CBA 1 areas that occur close to the site are Critically Endangered ecosystems identified either by the STEP Project. The study site occurs within the Albany Centre of Floristic Endemism and it forms part of the Maputoland-Pondoland-Albany Hotspot. Thicket is the most conspicuous component of this Centre and there is a high degree of endemism amongst succulent plants in this Centre of Endemism.

[7] The ECBCP which has integrated all previous studies, is a useful reference for identifying conservation issues in the study area, and surrounds.

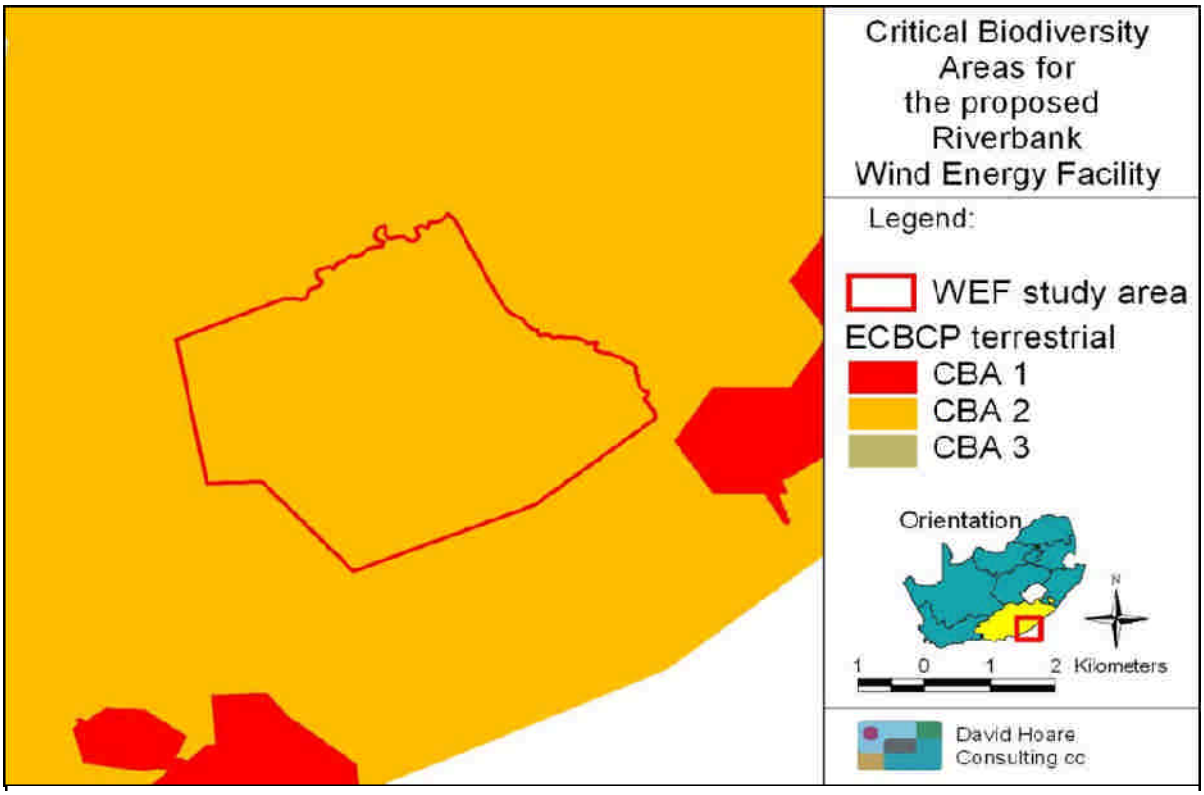


Figure 5.5: Critical biodiversity areas within the study area

5.5.4 Avifauna

At least 325 bird species are likely to occur, with some regularity within the vicinity of the study area. This includes 50 endemic or near-endemic species, 27 red-listed species, and 6 species which are both endemic and red-listed. Of these several sensitive species may include:

- Non-breeding flocks or breeding pairs of Blue Crane Cranes and Grey-crowned Cranes.
- Possible sporadic influxes of nomadic Denham's Bustard.
- A range of locally resident or visiting raptors, including Cape Vulture; Secretarybird; African Crowned Eagle; African Marsh Harrier; Lanner Falcon; and possibly including Forest Buzzard; Black Harrier and Peregrine Falcon.
- Individuals/flocks of foraging Southern Ground Hornbills.
- Flocks of coastal/wetland species commuting between resource areas, including Great White Pelican and possibly Greater Flamingo, and a suite of restricted range and/or red-listed grassland/savannah and forest species, possibly including Knysna Woodpecker and Knysna Warbler.

5.6 Social Profile

The study area is dominated by community and state-owned land, and features a distinct settlement pattern with a great number of villages or concentrated settlements spread throughout the region. The main economic activity related to this rural lifestyle is subsistence agriculture with little or no formal commercial agriculture or large-scale developments. The population density is estimated at approximately 50 people/km[28].

The proposed site is located within Ward 11 of the Ngqushwa Local Municipality, a category-B municipality[9] forming part of the Amathole District Municipality (category-C municipality). These municipalities are located in the southern coastal region of the Eastern Cape, approximately 232 km east of the Nelson Mandela Metropolitan area (i.e. Port Elizabeth). Hamburg and Peddie are the largest towns/urban nodes within the municipality, the latter of which is the administrative centre. Apart from these urban nodes, the majority of settlements in the municipality are rural villages surrounded by communal grazing lands.

5.6.1 Land Ownership of the Proposed Site

The proposed facility is located over 5 different farms – Riverbank 147, Sandflat 149, Holstein 148, Porcupine Kop 169, and Bristol 170. Riverbank 147 has 3 informal subdivisions and the title deeds were last registered in 1925. Sandflat 149 has 8 formal subdivisions of which only one has a legally secured registration. The other 7 were last registered in the 1950s. Holstein 148 has 4 subdivisions of which only one has a legal registration. The other 3 were promised to the current occupants but were never formally transferred and are still registered to the former Republic of Ciskei. Porcupine Kop 169 has no subdivision and is registered to the former Republic of Ciskei. Bristol 170 has no subdivision and is registered to the former Republic of Ciskei.

Just Energy is in the process of helping the land owners finalise the estates and develop Family Trusts for Riverbank 147 and Sandflat 149. In terms of Holstein 148, Porcupine Kop 169 and Bristol 170, Just Energy together with the Uncedo Lwethu Cooperative are in the process of obtaining a 25 year lease from the Government. This lease application will be made by the Uncedo Lwethu Farmers Cooperative to the Department of Rural Development and Land Reform to grant, a short term (5 years) lease followed by a long term (25 years) lease.

[8] Department of Environmental Affairs and Tourism (DEAT), 2001. Environmental Potential Atlas (ENPAT) for the Eastern Cape Province.

[9] A category-B municipality is defined as a municipality that shares executive and legislative authority in its area with a category- C municipality within whose area it falls.

5.6.2 Demographic Profile

According to Census 2001 data, the total population of Ward 11 was 6 728. It is assumed that the population would have increased marginally given the low positive population growth rate (1.2%) within the Ngqushwa Local Municipality according to the Municipal IDP (2007 - 2012). The black population group was the dominant group in 2001, accounting for 98.9% of the total population, the majority of which are isiXhosa-speaking individuals. The white population group constitutes 1.1% of the population followed by the coloured population group (0.1%). The <15 years age bracket in Ward 11 is relatively high at approximately 32.6%. The post retirement age group (>64) is moderate at approximately 7.4%. The dependency ratio[10] is 0.6, which means that approximately two working individuals support 1 non-working/unemployed individual.

Based on 2001 Census data, approximately 59.4% of the population in Ward 11, aged 15 and older, are estimated to be functionally illiterate/innumerate in 2001. Approximately 68.4% of the population have less than a Standard 5/Grade 7 education and 10.9% of the school going age population have a Matric qualification, while fewer than 5% have a tertiary qualification. Given the strong correlation between education and skills levels, it can be assumed that a significant portion of the study area's working age population only have sufficient skills for elementary jobs.

5.6.3 Economic Profile

Employment statistics from 2001 indicate that only 8.9% of Ward 11's population was employed in the formal sector with the unemployment rate estimated at approximately 35%. Approximately 56% of the population was listed as not economically active[11]. Given the rural subsistence economy of the Municipality, it is likely that those listed as 'not economically active' are involved in communal agricultural practices.

The largest employer in Ward 11 is the community and social services sector, which provides 24% of the formal employment in the area. This sector is followed by Private households, the business services sector, and the wholesale and retail trade sector, which provide 22%, 19%, and 16% of the employment in the Ward respectively. The other minor formal employment sector contributors are the construction sector (2.5%), the manufacturing sector (1.9%) and the transport and communications sector (1.4%).

Census data on household income for 2001 indicates that the vast majority of households (approximately 98%) in Ward 11 were living on less than the R1 600/ month

[10] The dependency ratio is calculated as the number of 0 to 14-year olds, plus the number of 65-year olds and older, divided by the number of people in the 15 to 64-year old age cohort. This is to give a rough indication of dependency.

[11] The term "not economically active" refers to people of working age not actively participating in the economy, such as early retirees, students, the disabled and home-makers.

minimum subsistence level. Significantly, the 'no formal income' category is the most pronounced at approximately 82%. Only approximately 2.5% of household heads earned an income clustered in the R800 - R3200/ month range.

The Amatole IDP refers to tourism and heritage. In terms of the study area the relevant route is the Sunshine Coast Route, which falls within the Ngqushwa Municipality and stretches from Port Elizabeth to East London. The Makana Heritage Route also falls within the study area and encompasses Peddie, Double Drift Game Reserve and Hamburg areas.

5.6.4 Municipal Objectives

Both the Ngqushwa Local Municipality and the Amathole District Municipality have developed socio-economic objectives. As part of the Local Economic Development Objectives of the Amathole Municipality's Integrated Development Plan (2009 - 2010), the sustainable utilisation of renewable resources is promoted as key in terms of Environmental Management. This includes the promotion of renewable resources through the encouragement of behavioural changes in terms of renewable resources. Capacity building and awareness in terms of environmental issues is also targeted as a key project. The Ngqushwa Local Municipality's Local Economic Development Plan highlights the issue of land distribution and rights as a key issue and promotes the restitution of insecure and informal land rights.

5.6.5 Ambient Noise Profile

The study area has a rural character in terms of background noise levels where continuous A-weighted[12] background ambient sound levels of less than 35 dBA can be expected (areas away from any activity) with wind speeds below 5 m/s. However, while the character of the area might be rural, there are numerous potential receptors living within a radius of 2 000 m from/in the study area.

The ambient daytime sound levels range between 35 – 51 dBA. Most of the ambient day-time noise comes from the provincial road in the area, although the noise due wave action of the ocean was also considered. A noise level of 65 dBA was assumed in the area where waves break, although it should be noted that during time when wind is blowing, increased turbulence will result in significantly higher noise levels. Other noise sources were not added to this ambient sound map, which would typically include dogs barking and farm animals; radios or TVs playing in the background; people speaking and other activities, such as farming activities.

[12] An internationally standardised frequency weighting which approximates the frequency response of the human ear and gives an objective reading, which therefore agrees with the subjective human response to that sound.

Night time ambient sound levels range between 35 – 55 dBA. The R72 provincial road cannot be excluded as a potential noise source at night. Another noise source is the noises of animals in the surrounding community and dwellings.

5.7 Heritage Profile

The archaeology of the study area is not well known as no systematic research has been conducted. The area proposed for the facility borders on a coastal archaeologically sensitive area, which is within 5 km of the coast. The area is also bordered by main river courses and streams which would have been a major attraction for prehistoric hunter-gatherers as well Khoekhoen pastoralists and Iron Age first farming communities which may have infiltrated the area within the last 2 000 years. Therefore several focus areas for the prehistoric human settlement can be identified: the coastal zone, the main river courses and river valleys, and hilltops.

Random scatters of Middle Stone Age stone artefacts were observed within disturbed quarry and eroded donga areas over the area proposed for development. The stone artefacts comprised mainly of flakes with facetted platforms and cores made predominantly on fine-grained quartzite, shale, and quartz raw materials. The stone artefacts were observed in a secondary, disturbed context, although, it is likely that stone artefacts would occur between the surface and 50-80 cm below ground underneath the dense grass vegetation cover. No depth of deposit or other archaeological material remains were observed in association with the stone artefacts.

Two scatters of very fragmented marine shell were observed on Riverbank 147 and Sandflat 149 within the farm roads. However, no positive identification of edible marine shells could be determined and most of the marine shell scatter comprised of smaller inedible marine shell. This may imply that the material is not of archaeological origin. A possible Historical/Late Iron Age settlement showing various sizes of circular raised features and depressions hollows was observed on Sandflat 147 approximately 100 m from the farmhouse. However, the features may be of recent origin. Possible informal burials identified by a few packed stones were observed about 100 m from a modern grave close to the farm house on Riverbank 147.

5.8 Palaeontology Profile

The area under consideration is underlain by two sedimentary successions. Firstly the older upper Permian Beaufort Group, Karoo Supergroup fluvial sediments (c. 250 million years old) and secondly the overlying younger (Plio-Plistocene) aeolian Nanaga Formation of the Algoa Group (c. 2.5 million years old) in orange. Fossils of terrestrial and marine organisms have over the past 150 years been recovered from both these

sedimentary successions respectively and are today preserved in South African museum and universities, making up part of the National Estate.

The proposed study area is underlain by lower Beaufort Group rocks of the upper Middleton Formation and the over lying lower Balfour Formation. To date the exact boundaries between individual biozones in this area have not been well defined because of a paucity of outcrops and hence the low number of identifiable fossils that have been collected in the past. With currently available data it is estimated that the wind energy facility footprint straddles two biozones[13] namely (oldest at the base):

» Lower *Dicynodon* Biozone
» *Cistecephalus* Biozone *(age at top 255 Ma)*.

The predominantly terrestrial sediments of the Beaufort Group have, throughout South Africa, yielded a large number of vertebrate fossils in the form of amphibians, early primitive reptiles (the captorhinids), mammal like reptiles (therapsids), and fish. Minor freshwater invertebrates (molluscs) and plant fossils have also been recovered. Assemblages of these fossils (mainly using the therapsids) have been used to define the eight biozones of the Beaufort Group (Rubidge et al., 1995). For the most part, the fossils found in the Beaufort sediments are rare, particularly in the lowermost part of the succession. No potential fossil bearing Beaufort Group rock outcrops were located with the proposed facility footprint.

[13] Biostratigraphic units or Biozones are intervals of geological strata that are defined on the basis of their characteristic fossil taxa.

ASSESSMENT OF IMPACTS: WIND ENERGY FACILITY CHAPTER 6

The generation of electricity from the proposed Riverbank Wind Energy Facility will be achieved using up to 22 wind turbines (in a phased approach) with a maximum generating capacity of 66 MW and the following associated infrastructure:

» **22 wind turbines** with a hub height of up to 90 m each, to be secured using concrete foundations.
» On-site **substation(s)** to facilitate the connection between the facility and the grid via the Wesley Substation.
» The wind turbines will be connected to each other and to the on-site substation(s) via electrical transformers at the base of each turbine, using 22 kV medium voltage **cables**, buried approximately 1 m deep.
» Distribution **power line(s)** to connect to Eskom's existing Wesley Substation which is located approximately 5 km west of the site.
» **Internal access roads** to the site and to each turbine.
» Ancillary infrastructure including a control room; workshop; high voltage switchgear room; mess room; ablution facilities; a SCADA[14] room; and a storeroom.

The establishment of a wind energy facility is comprised of several phases, including pre-construction, construction, operation, and decommissioning. The **construction activities** involved for the proposed facility will include the following:

» Conduct pre-construction surveys;
» Establishment of access roads within the site;
» Undertaking site preparation (i.e. including clearance of vegetation; and stripping of topsoil);
» Establishment of laydown areas on site;
» Construction of turbine and building foundations;
» Transportation of components and equipment to site;
» Assembly of wind turbines;
» Construction of the on-site substation(s);
» Establishment of the service related buildings (i.e. a workshop, a contractor's equipment camp, an operations and maintenance facility, including a storage building);
» Connection of the wind turbines to the on-site substation(s); and
» Undertake site remediation.

[14] Supervisory control and data acquisition, it generally refers to industrial control systems: computer systems that monitor and control industrial, infrastructure, or facility-based processes

The **operational activities** will include the following:

» The operation of the wind turbines; and
» Site operation and maintenance.

The **decommissioning activities** will include the following:

» Removal of project infrastructure; and
» Site rehabilitation.

The construction and decommissioning activities have the potential to impact on the receiving environment in terms of habitat destruction/loss, disturbance, soil degradation; increased erosion potential; impacts on biodiversity; threatened fauna / flora species; ecological processes; heritage sites; and the visual aesthetics of the site.

Environmental issues specific to the operation phase of a wind energy facility include, amongst others, visual impacts through the visual dominance of the turbines within the landscape; avian and bat mortality through collisions/electrocutions with the power line and/or turbines and barotrauma; and low frequency noise associated with rotation of the blades.

These and other environmental issues were originally identified through a scoping evaluation of the proposed facility. Potentially significant impacts have now been assessed during this EIA Phase through specialist studies (refer to Appendices E to L). This EIA process has involved key input from specialist consultants, the project developer, and from key stakeholders and interested and affected parties. The significance of impacts associated with a facility of this nature is always project specific, and therefore impacts may vary significantly between facilities.

This chapter serves to assess the identified potentially significant environmental impacts associated with the development of the proposed facility, and to make recommendations for the management of these impacts for inclusion in the draft EMP (refer to Appendix M).

6.1 Issues identified during the Public Participation Process

The purpose of this chapter is to assess the potential impacts (i.e. both positive and negative) associated with the proposed facility. These include but are not limited to issues raised during the public participation process undertaken during the Scoping Phase, which included the following:

Social impacts

» Health and safety
» Potential noise and visual impacts
» Impacts on tourism and land values
» Provision of alternative grazing
» Impacts on heritage resources
» The role and importance of public participation
» Employment opportunities
» Skills development
» Influx of jobseekers
» Operating mechanism for the Cooperative Agreement
» Integration of the facility with the Eskom grid
» Recourse for the communities

Biophysical impacts

» Ecology impacts including avifauna, bats, wetland species, and endangered tree species

6.2 Assessment of Alternatives

This chapter provides an assessment of the feasible and reasonable project alternatives considered through the EIA process, as required in terms of the EIA Regulations. The following alternatives have been considered:

» ***'Do nothing' alternative:*** Just Energy does not establish a wind energy facility in the Eastern Cape (i.e. maintain status quo).
» ***Power evacuation options*** - four options are proposed and have been assessed. Options 1 and 2 include one substation and one power line for both phases. Options 3 and 4 include two separate substations and power lines serving each phase.
» ***Site specific alternatives*** - relating to the layout of the wind turbines and internal access roads over the broader identified site of 20 km^2.

6.2.1 The 'do nothing' Alternative

Internationally there is increasing pressure on countries to increase their share of renewable energy generation due to concerns such as climate change and resource exploitation (i.e. coal and oil). The South African Government has set a ten year cumulative target for renewable energy generation of 10 000 GWh by 2013, to be produced mainly from biomass; wind; wind; and small scale hydro. This amounts to approximately 4% (1 667 MW) of the total estimated electricity demand (41 539 MW) by 2013. In responding to the growing electricity demand within South Africa, as well as the country's targets for renewable energy, IPPs are being encouraged to develop renewable energy projects and contribute to these targets.

The 'do nothing' alternative translates to Just Energy not establishing a wind energy facility on the identified site within the Eastern Cape that is, maintaining the status quo with the following resultant impacts:

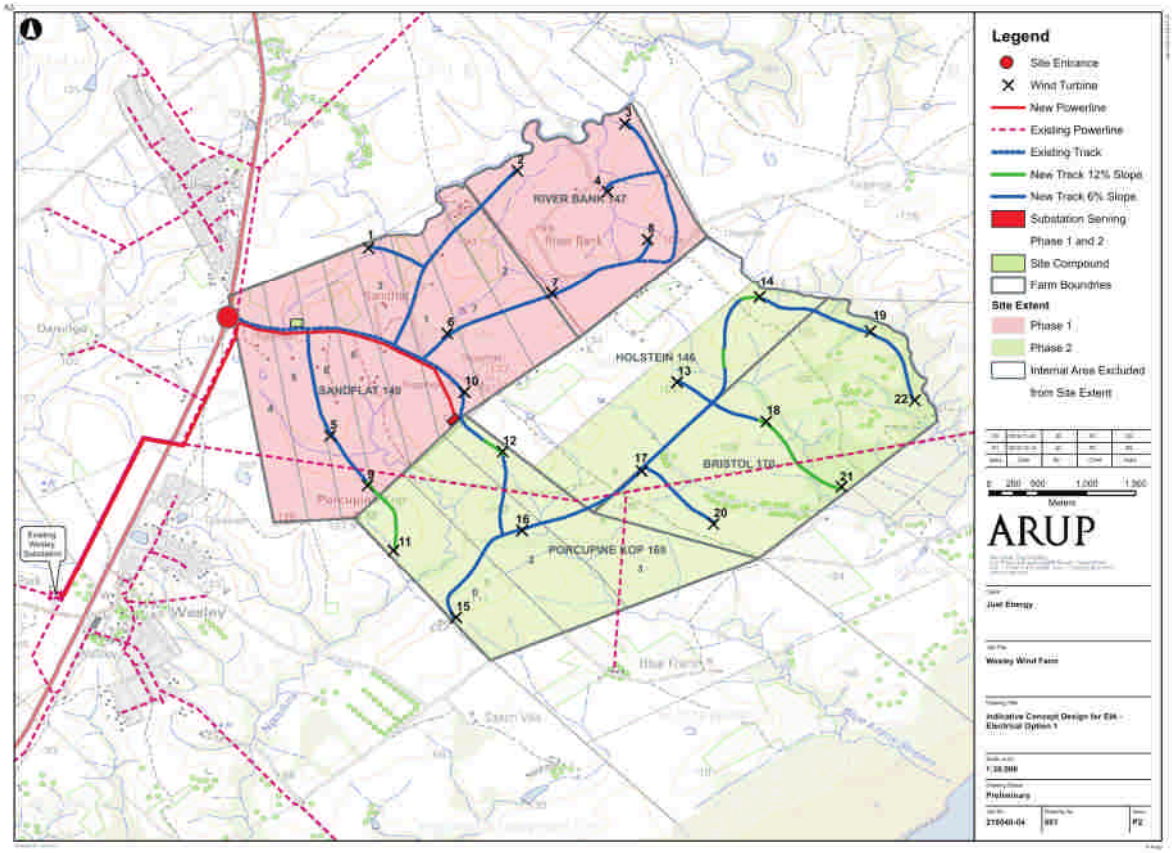
» The no-go alternative means that the benefits from the cooperative agreement between the developers and local community would not be realised. The co-operative agreement which has been proposed states certain percentages of the equity shareholding revenue for activities such as community projects to ensure the responsible use of the monies received.
» The affiliated local community will not receive an annual revenue stream via the equity shareholding, and the landowners would not receive any annual rental income.
» The potential employment, economic benefits and as well as potential positive impacts on the local economy associated with the additional spending by construction workers in the local economy will be foregone.
» The potential to harness and utilise the excellent wind resources at the identified site would be lost.
» The project would not assist the South African Government in reaching their renewable energy targets as published in the Renewable Energy White Paper.
» The National electricity grid would not benefit from the additional power (i.e. a maximum of 70 MW) that could be generated by the proposed facility.

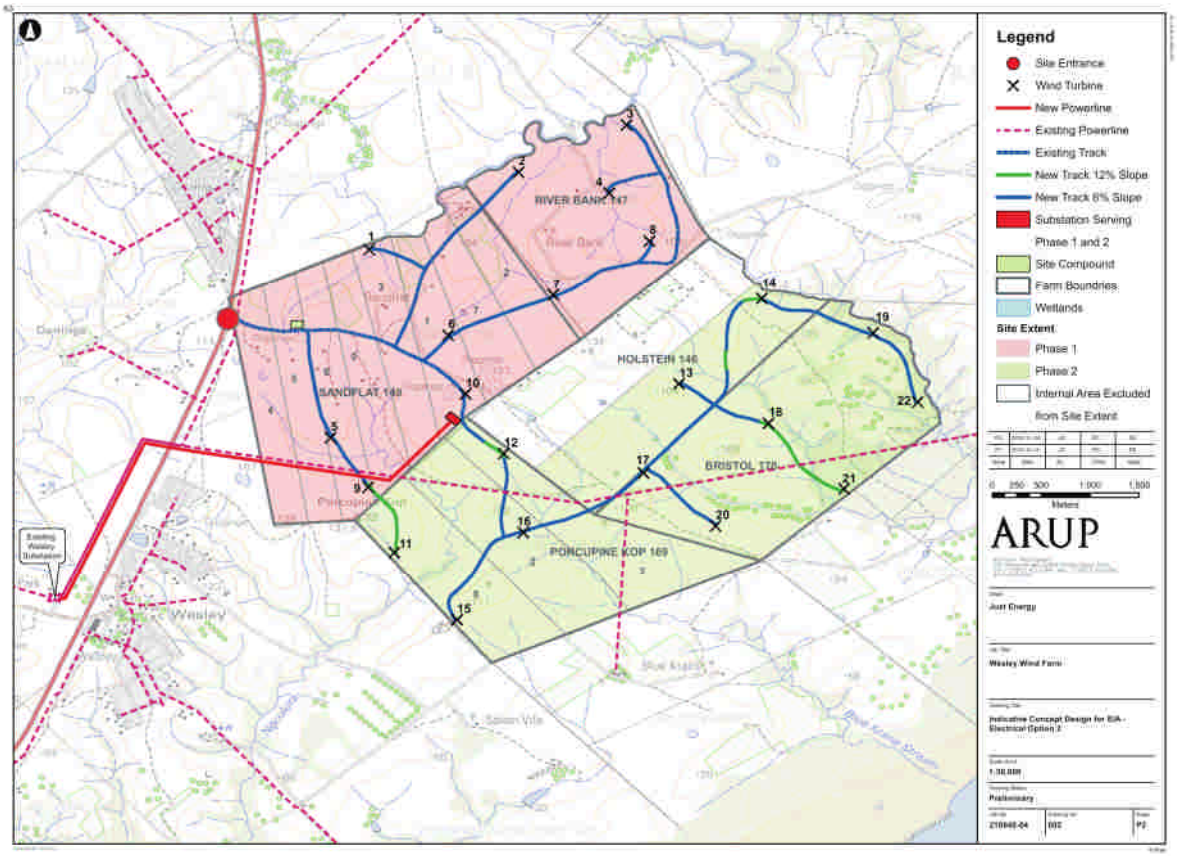
This is, therefore, not a preferred alternative.

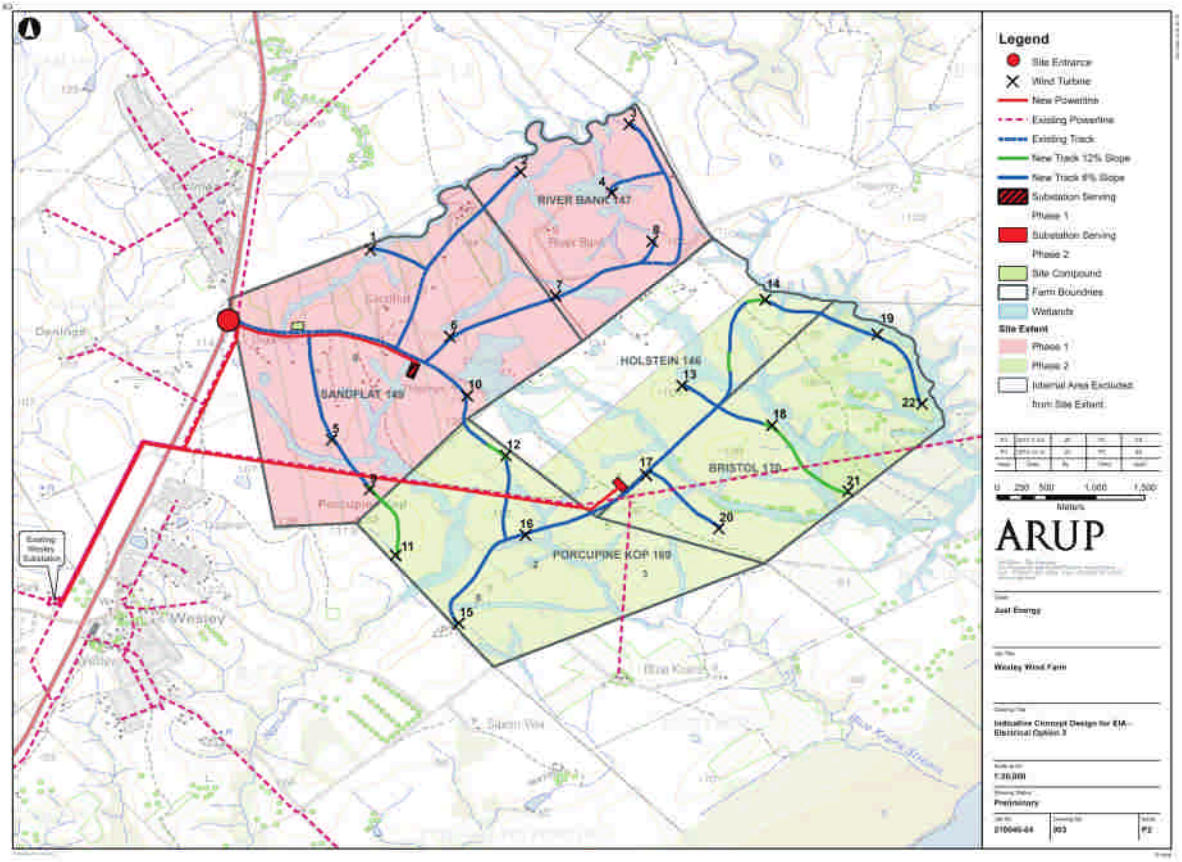
6.2.2 Power Evacuation Options

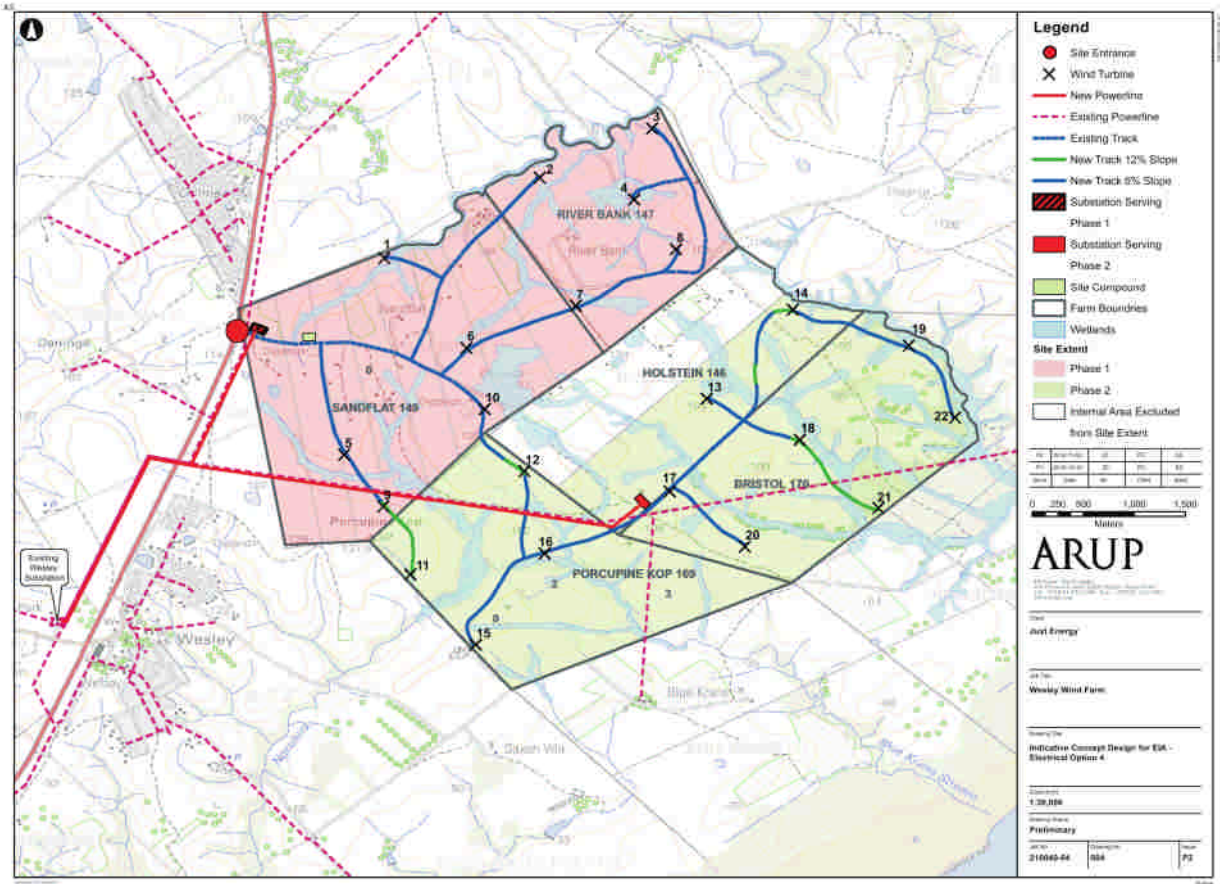
In order to transfer the power generated at the facility site to the Eskom grid, overhead distribution power line(s) will connect between the on-site substation(s) to Eskom's Wesley Substation located approximately 5 km west of the site. Four options have been provided regarding the substation position/s and power line routing (refer to Figures 6.1 – 6.4). The options can be summarised in the tables that follows:

Option	Substation configuration	Overhead Power Line Route
1	1 substation, sized to serve Phase 1 + 2.	Single corridor follows line of existing road through Sandflat 149 to meet and then run alongside existing 22kV power line on R72, up to point of connection at Wesley substation.
2	1 substation sized to serve Phase 1 + 2.	Single corridor traverses Sandflat 149 to meet and then run alongside existing 22kV power line within Sandflat 149, up to point of connection at Wesley substation.
3	2 individual substations, sized to serve Phases 1 and 2 respectively, each located centrally within associated phases.	Two corridors serving each phase. Phase 1 corridor follows line of existing road through Sandflat 149 to meet and then run alongside existing 22kV power line on R72, up to point of connection at Wesley substation. Phase 2 corridor traverses Sandflat 149 to meet and then run alongside existing 22kV power line within Sandflat 149, up to point of connection at Wesley substation.
4	2 individual substations, sized to serve Phases 1 and 2 respectively, each located centrally within associated phases.	Corridors as per Option 3, with the exception of a shorter corridor run within Sandflat 149 for Phase 1.




Legend
Site Entrance
Wind Turbine
New Powerline
Existing Powerline
Existing Track
New Track 12% Slope
New Track 6% Slope
Substation Serving Phase 1 and 2
Site Compound
Farm Boundries
Wetlands
Site Extent
Phase 1
Phase 2
Internal Area Excluded from Site Extent
RIVER BANK 147
SANDFLAT 148
HOLSTEIN 146
BRISTOL 110
PORCUPINE KOP 169
ARUP


Legend
Site Entrance
Wind Turbine
New Powerline
Existing Powerline
Existing Track
New Track 12% Slope
New Track 6% Slope
Substation Serving Phase 1
Substation Serving Phase 2
Site Compound
Farm Boundries
Wetlands
Site Extent
Phase 1
Phase 2
Internal Area Excluded from Site Extent
RIVER BANK 147
SANDFLAT 148
HOLSTEIN 146
BRISTOL 110
PORCUPINE KOP 169
ARUP



Figures 6.1 – 6.4 The four power evacuation options assessed within the EIA

6.3 Quantification of the Area that will Potentially be Affected by the Facility

In order to assess the potential impacts associated with the proposed facility, it is first necessary to understand the extent of the affected area. This includes the area infrastructure (i.e. wind turbines, substation(s) and service buildings) and the linear infrastructure (i.e. internal access roads and the power line(s)). A broader site of 20 km^2 was originally identified by the project developer for the purposed of establishing the proposed facility. However, the areas affected during the construction (temporarily affected) and operational (permanently affected) phases will differ.

Permanently affected areas comprise 22 turbine footprints (22 foundation areas of 20 m x 20 m in extent), access roads (6 m wide), substation footprint (worst case scenario of 120 m x 70 m in extent for option 1), and a single storey building for the establishment of ancillary infrastructure (~350 m^2). The area of permanent disturbance is therefore as follows:

Facility component - permanent	Approximate area/extent (in m^2)
22 turbine footprints (each 20 m x 20 m)	8 800
Permanent internal access roads (6 m x 22 km)	132 000
Substation footprint (120 m x 70 m)	8 400
Ancillary infrastructure	350
TOTAL	**149 550** (of a total area of 20 000 000) = ~0.7% of site

Temporarily affected areas comprise laydown areas for turbines (each laydown area with a footprint of 150 m x 20 m as a worst case scenario) as well as a track of an additional 8 m in width for the crawler crane to move across the site (i.e. an additional 8 m width to the permanent road of 6 m in width). The 33 kV cabling to connect the turbines to the substation is to make use of the disturbed area travelled over by the crane. An approximately 1 m wide trench would be excavated, the cabling laid, and the area rehabilitated. The area of temporary disturbance is as follows:

Facility component - temporary	Approximate area/extent (in m^2)
22 turbine laydown areas (150 m x 20)	66 000
Temporary crane travel (14 m) (including a cable trench (1 m))	308 000
Construction site compound	7 500
Power line corridor (2 km on-site x 8 m servitude required to be cleared)	16 000
TOTAL	397 500 (of a total area of 20 000 000) = ~1.6% of site

Therefore, a total area of 397 500 m^2 can be anticipated to be disturbed to some extent during the construction of the wind energy facility. This amounts to **approximately 1.6%** of the total area which will form part of the total facility.

6.4 Assessment of Potential Impacts

The sections which follow provide a summary of the findings of the assessment undertaken for potential impacts associated with the construction and operation of the proposed wind energy facility on the identified site near Wesley within the Eastern Cape. Issues were assessed in terms of the criteria detailed in Chapter 4. The nature of the potential impact is discussed, and the significance is calculated with and without the implementation of mitigation measures. Recommendations are made regarding mitigation and management measures for potentially significant impacts and the possibility of residual and cumulative impacts are noted.

6.4.1 Assessment of Potential Ecological Impacts

Major potential impacts on ecology are described briefly below. There are two major ways that a wind energy development may impact on the ecological environment: a) through direct impacts on individual organisms and b) through impacts on habitat structure and functioning.

Areas containing untransformed natural vegetation, high diversity, or habitat complexity, Red List organisms or systems vital to sustaining ecological functions are considered sensitive. A map of sensitive areas is shown in Figure 6.5, and identifies those parts of the study area that have high conservation value or that may be sensitive to disturbance (with any transformed area that has no importance for the functioning of ecosystems is considered to have low sensitivity). This map indicates that the remaining natural vegetation on site as well as wetlands and drainage lines have high sensitivity, and transformed and degraded areas have low sensitivity.

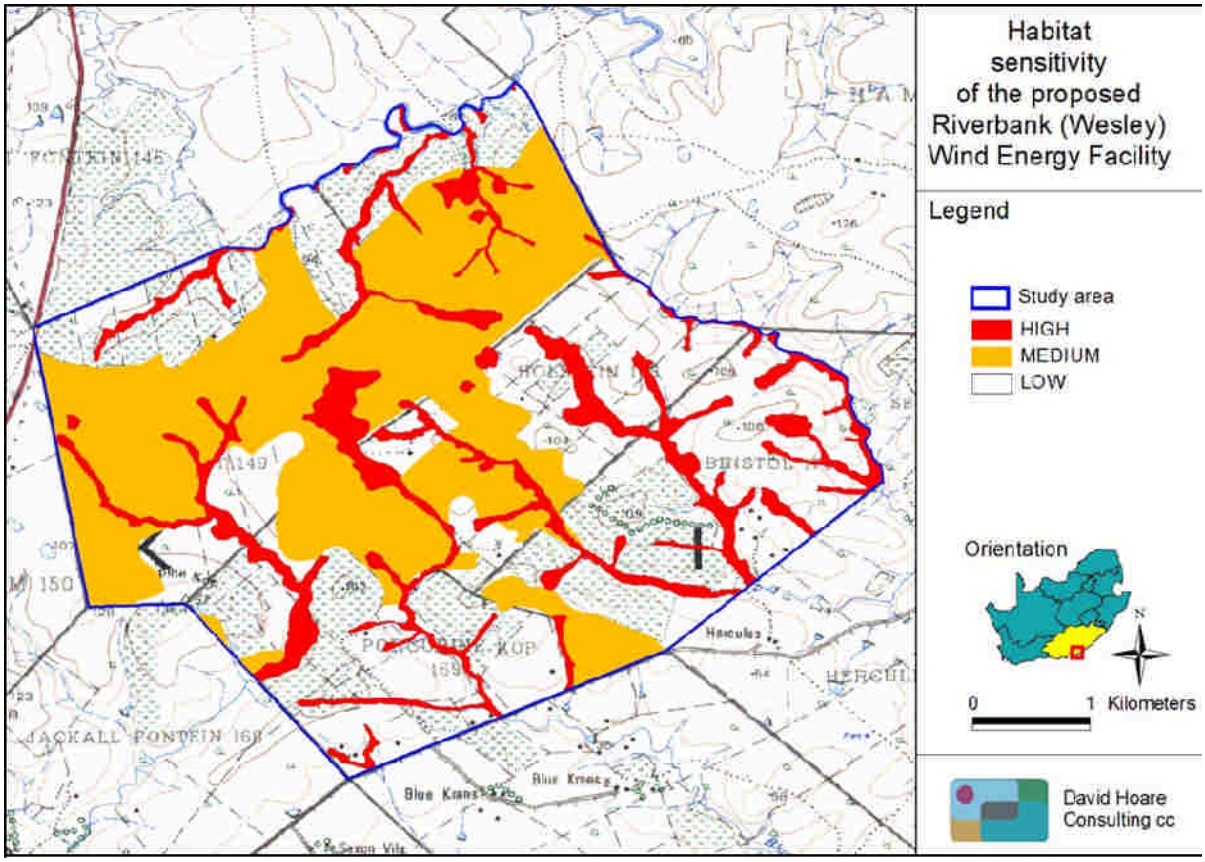


Figure 6.5: Map indicating the sensitive ecological areas in the study area

Large parts of the study area are still in natural condition, although parts may be degraded due to communal livestock farming. All transformed and degraded areas on site are classified as having low sensitivity and conservation value. Most of the natural areas are classified as having moderate sensitivity and conservation value. This is

because the vegetation has been quite heavily impacted upon by livestock grazing and other activities on site and is in moderate to poor condition. There is one small area near the centre of the site within which some good quality grassland with relatively unique species composition occurs. This is on a small hill which is the highest point on site. Due to the elevated position of this hill, the ecological conditions have allowed for the development of plant communities that are different to the surrounding areas. The condition and unique species composition of this small area has resulted in this area being classified as having high sensitivity and conservation value.

There are two Orange List plant species that could occur in available habitats in the study area. This includes one species classified as Rare and one as Declining. Both of these species are considered to be of lower conservation concern and construction of the proposed wind energy facility is unlikely to affect these species significantly.

It has been evaluated that there are two bat species listed globally as Near Threatened that could occur on site, the Natal Long-fingered Bat and the Cape Horseshoe Bat.

It has been evaluated that there are three non-flying mammal species of conservation concern that could potentially occur on site including two species classified as Endangered (EN) and one species classified as Near Threatened (NT). The EN species are the Samango Monkey and the Giant golden Mole. The NT species is the Brown Hyena. Two threatened reptile species have a distribution that includes the study area and could occur on site (i.e. the African Rock Python (VU) and the Yellow-bellied House Snake (NT). Of these species that are considered to have some chance of occurring on site, some are mobile animals that are likely to avoid the site during construction and re-appear afterwards if they wish to return. The species of small animals that are likely to be restricted to the site, if they occur there, and are unlikely to be able to move away during the construction phase, or are dependent on habitats on site remaining intact, are the Giant Golden Mole, the African Rock Python and the Yellow-bellied House Snake. These species are likely to be affected, if they do occur there. Suitable habitat for the Giant Golden Mole only occurs off-site, so this species is unlikely to be directly affected by construction activities on site.

A risk assessment was undertaken which identified seven main potential impacts on the ecological receiving environment. The significance of these impacts was assessed after collection of relevant field data. The identified potential negative impacts are the following (with potential significance without mitigation measures given in brackets):

1. Impacts on bats (low to medium);
2. Impacts on threatened animals (low);
3. Impacts on threatened plants (zero);
4. Impacts on protected tree species (low);
5. Impacts on indigenous natural vegetation (medium to high);
6. Impacts on wetlands (low to high);

7. Establishment and spread of declared weeds and alien invader plants (medium); and
8. Increased risk of veld fires (zero).

Impact table summarising the significance of impacts on the vegetation and general ecology (with and without mitigation)

The ratings below represent a best and worst case scenario of the potential impacts on/from bats, threatened animals, protected tree species, indigenous natural vegetation, wetlands, the spread of alien vegetation. These impacts have been assessed in relation to the construction and operation of the wind turbines, the substation(s), the power line(s), the internal access roads, and the underground cabling between the turbines.

The significance of potential impact on threatened or near threatened plant species is not evaluated further as no species of this nature are likely to occur on the site. Furthermore the potential significance of veld fires is also not evaluated further as this impact is likely to be low. The site is within an area of grassland that is managed communally and experiences natural fires, although the natural frequency of these is probably low compared to deliberate burns. It is therefore unlikely that increased fire frequencies would occur because of the operation of the infrastructure.

Nature: Impact on bat species due to turbines, substation(s), and power line(s) Bat mortality may occur due to either direct strikes (i.e. with the turbines or power lines) or due to barotrauma (bats are killed when suddenly passing through a low air pressure region surrounding the turbine blade tips causing low pressure damage to the bat's lungs (Baerwald *et al*. 2008). Directs strikes with the power lines are less likely to occur as bats have the ability to use echo-location to avoid stationary obstacles. Two Near Threatened species could be affected by the proposed facility (i.e. the Natal Long-fingered Bat and the Cape Horseshoe Bat). These species are most likely to be affected by the operation of the turbines during the operation of the facility than during the construction phase.		
	Without mitigation	***With mitigation***
Extent	Local (1) for substation(s), and power line(s)- Regional (3) for turbines	Local (1) for substation(s), and power line(s)- Regional (3) for turbines
Duration	Long term (4) for turbines, substation(s), and power line(s)	Long term (4) for turbines, substation(s), and power line(s)
Magnitude	Minor (2) for substation(s), and power line(s) Moderate (6) for turbines	Minor (2) for substation(s), and power line(s) Low (4) for turbines
Probability	Improbable (2) for substation(s) and power line(s) Highly probable (4) for turbines	Improbable (2) for substation(s) and power line(s) Probable (2) for turbines
Significance	**Low (14)** for substation(s) and power line(s) **Moderate (52)** for turbines	**Low (14)** for substation(s) and power line(s) **Moderate (33)** for turbines
Status (positive or	Negative	

negative)	
Reversibility	Not reversible
Irreplaceable loss of resources	Yes
Can impacts be mitigated	To some degree
Mitigation: A monitoring programme should be implemented to document the effect of the facility's operation on bats. This should take place prior to construction (to provide a benchmark), and during operation. If the turbines are found to have a significant negative impact on bats then further measures will need to be implemented to control the impact, for example, halting operation during low wind conditions when bats are most active.	
Cumulative impacts: No other cumulative impacts are expected.	
Residual impacts: No residual impacts are expected.	

Nature: Impact on non-flying threatened species due to habitat loss due to turbines, substation(s), power line(s) and access roads

Threatened animal species are affected primarily by the overall loss of habitat, since direct construction impacts can often be avoided due to movement of individuals from the path of construction. Other than bats, which are evaluated above, three mammal species of conservation concern could potentially be affected by the proposed facility including two species classified as Endangered (i.e. Samango Monkey and the Giant Golden Mole) and one species classified as Near Threatened (NT) (i.e. Brown Hyena). Two threatened reptile species that have a distribution across the study area could also be affected (i.e. African Rock Python and Yellow-bellied House Snake). Of these species some are mobile animals that are likely to avoid the site during construction and may re-appear afterwards. The species that are likely to be restricted to the site and are therefore dependent on the habitats within the site remaining intact, include the Giant Golden Mole, the African Rock Python, and the Yellow-bellied House Snake.

	Without mitigation	***With mitigation***
Extent	Local (1) for turbines, substation(s), power line(s) and roads/cabling	Local (1) for turbines, substation(s), power line(s) and roads/cabling
Duration	Permanent (5) for turbines, substation(s), power line(s) and roads/cabling	Permanent (5) for turbines, substation(s), power line(s) and roads/cabling
Magnitude	Minor (2) for turbines, substation(s), and power line(s) Low (4) for roads/cabling	Minor (2) for turbines, substation(s), and power line(s) Low (4) for roads/cabling
Probability	Improbable (2) for turbines, substation(s), power line(s) and roads/cabling	Improbable (2) for turbines, substation(s), power line(s) and roads/cabling
Significance	**Low (16)** for turbines, substation(s), and power line(s)	**Low (16)** for turbines, substation(s), and power

	Low (20) for roads/cabling	line(s) **Low (20)** for roads/cabling
Status (positive or negative)	Negative	
Reversibility	Not reversible	
Irreplaceable loss of resources	Yes	
Can impacts be mitigated	To some degree	
Mitigation: On the condition that natural habitat is not affected to a significant degree, it is unlikely that construction of turbines will have a significant impact. Unnecessary impacts on terrestrial habitats and drainage lines should be avoided as this will ensure that potential habitat for fauna is affected to the minimum. Therefore no specific mitigation measures are required.		
Cumulative impacts: Impacts that cause loss of habitat (e.g. soil erosion, alien invasions, damage to wetlands and increased frequency of veld fires) may exacerbate this impact.		
Residual impacts: There are unlikely to be residual impacts.		

Nature: Loss of individuals protected tree species due to habitat loss from turbines, and access roads A number of species have a geographic distribution that includes the study area, primarily in forest habitat. Based on the assessment of available habitat, Coastal Red Milkwood and Cheesewood could occur on site, but were not found on site. Individual White Milkwood specimens were found scattered in the dense woodland at the lower end of the drainage lines. The substation and power line options are all in positions where there are no individuals of protected trees and where these trees are highly unlikely to occur. The species will therefore not be affected and the significance of this potential impact is scored as zero (i.e. it will not occur).		
	Without mitigation	***With mitigation***
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Moderate (6)	Moderate (6)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (14)**	**Low (14)**
Status (positive or negative)	Negative	
Reversibility	Not reversible	
Irreplaceable loss of resources	Yes	
Can impacts be mitigated	No	
Mitigation: A permit to remove protected tree species will need to be obtained.		

Cumulative impacts: Soil erosion, alien invasions, damage to wetlands and increased frequency of veld fires may all lead to additional loss of habitat that could potentially exacerbate this impact.
Residual impacts: No residual impacts are expected.

Nature: Loss or fragmentation of indigenous natural vegetation from turbines, substation(s), power line(s), and roads

Construction activities may lead to a direct loss of vegetation which will lead to localised or more extensive reduction in the overall extent of the vegetation. Where this vegetation has already been stressed due to degradation and transformation at a regional level, the loss may lead to increased vulnerability of the habitat and a change in the conservation status. The vegetation on site is classified as Least Threatened; however, the site falls within the Albany Centre of Endemism and affects areas classified as important corridors or habitats in the ECBCP.

	Without mitigation	***With mitigation***
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Small (1) for substation(s) Minor (2) for turbines and power line(s) Low (4) for roads High (8) for substation options 1 and 2	Small (1) for substation(s) options 3 and 4 Minor (2) for turbines, power line options 1 and 2 and roads
Probability	Probable (3) for power line options 3 and 4 Definite (5) for turbines, substation(s) power line options 1 and 2, and roads	Probable (3) for power line options 3 and 4 Definite (5) for turbines, substation(s) power line options 1 and 2, and roads
Significance	**Low (24)** for power line options 3 and 4 **Medium (35)** for substation options 1 **Medium (40)** for turbines and power line options 1 and 2 **High (70)** for substation option 2	**Low (21)** for power line options 3 and 4 **Medium (35)** for substation(s) **Medium (40)** for turbines and power line options 1 and 2
Status (positive or negative)	Negative	
Reversibility	Not reversible	
Irreplaceable loss of resources	Yes	
Can impacts be mitigated	No	

Mitigation:

» Unnecessary impacts on terrestrial habitats should be avoided.

» Construction activities must be contained within the footprint of the turbine, laydown area

and access roads. » For substation option 1 & 2, the substation must be shifted 200 m north-west. » The section of road between turbines 10 and 12 should be moved to avoid the hill and sensitive vegetation. » For other internal access roads, avoid unnecessary impacts on natural vegetation surrounding roads. Impacts should be contained, as much as possible, within the footprint of the road.
Cumulative impacts: Soil erosion, alien invasions, damage to wetlands and increased frequency of veld fires may all lead to additional loss of habitat that will exacerbate this impact.
Residual impacts: Some loss of this vegetation type will possibly occur.

Nature: Damage to wetlands from turbines, substation(s), power line(s) and roads
The site contains a number of streams and drainage lines, and one of the major on-site wetland systems constitutes part of the catchment for an estuary on the coast located downstream of the site. However, no turbines are situated within wetlands and are all situated a minimum distance of 50 m from mapped wetland areas. Construction activities (including the construction of access roads) may lead to some direct or indirect loss of or damage to seasonal marsh wetlands or drainage lines or impacts that affect the catchment of these wetlands. This will lead to localised loss of wetland habitat and may lead to downstream impacts that affect a greater extent of wetlands or impact on wetland function. Where these habitats are already stressed due to degradation and transformation, the loss may lead to increased vulnerability of the habitat.

	Without mitigation	***With mitigation***
Extent	Local and surroundings (2) for turbines, substation(s), power line(s), and roads	Local and surroundings (2) for turbines, substation(s) , power line(s), and roads
Duration	Long-term (4) for turbines, substation(s) Permanent (5) for power line(s), and roads	Long-term (4) for turbines, substation(s) Permanent (5) for power line(s), and roads
Magnitude	Moderate (6) for turbines, substation(s), power line(s), and roads	Minor (2) for substation(s) Low (4) for turbines, power line(s), and roads
Probability	Improbable (2) for turbines, substation(s) Definite (5) for roads	Improbable (2) for turbines, substation(s) Definite (5) for roads
Significance	**Low (24)** for substation(s) **Low (26)** for turbines, power line(s) **High (65)** for roads	**Low (24)** for substation(s) **Low (22)** for turbines, power line(s) **Medium (55)** for roads
Status (positive or negative)	Negative	
Reversibility	Reversible with effective rehabilitation	

Irreplaceable loss of resources	Yes
Can impacts be mitigated	To some degree
Mitigation: » Stormwater and runoff water must be controlled to avoid siltation and surface hydrological impacts on wetlands. » Move substation (Option 3) slightly away from the wetland boundary. » Place power line pylons on either side of wetlands or a minimum of 50 m from wetland boundaries. » For any internal access road that is not moved, a permit will need to be obtained from DWA to impact on any wetland or water resource.	
Cumulative impacts: Soil erosion, alien invasions, and increased frequency of veld fires may all lead to additional impacts on wetland habitats that will exacerbate this impact.	
Residual impacts: Despite proposed mitigation measures, it is expected that this impact will still occur to some degree.	

Nature: Establishment and spread of declared weeds and alien invader plants for turbines, substation(s), power line(s), and roads
Major factors contributing to invasion by alien invader plants includes high disturbance, fostering/utilisation as hedges, woodlots or fruit trees, negative grazing practices, and deforestation (Zachariades et al. 2005). The following species are likely to invade the site, given the right conditions, Golden wattle, black wattle, Jimson weed, Lantana camara, Prickly pear, Kikuyu, and Rough cocklebur. The potential therefore exists for extensive and diverse invasion of the site. The habitats most likely to be affected include watercourses and grasslands.

	Without mitigation	***With mitigation***
Extent	Site and surroundings (2) for turbines, substation(s), power line(s) and roads	Site and surroundings (2) for turbines, substation(s), power line(s) and roads
Duration	Long-term (4) for turbines, substation(s), power line(s) and roads	Long-term (4) for turbines, substation(s), power line(s) and roads
Magnitude	High (8) for turbines, substation(s), power line(s) and roads	Low (4) for turbines, substation(s), power line(s) and roads
Probability	Highly probable (4) for turbines, substation(s), power line(s) and roads	Improbable (2) for turbines, substation(s), power line(s) and roads
Significance	**Moderate (56)** for turbines, substation(s), power line(s) and roads	**Low (20)** for turbines, substation(s), power line(s) and roads
Status (positive or negative)	Negative	
Reversibility	Reversible	

Irreplaceable loss of resources	Yes
Can impacts be mitigated	To some degree

Mitigation:

» Disturbance of indigenous vegetation must be kept to a minimum.
» Disturbed areas should be rehabilitated as quickly as possible.
» Soil stockpiles should not be translocated from areas with alien plants into the site and within the site alien plants on stockpiles must be controlled to avoid the development of a soil seed bank of alien plants within the stock-piled soil.
» Any alien plants must be immediately controlled to avoid establishment of a soil seed bank that would take decades to remove.
» An ongoing monitoring programme should be implemented to detect and quantify any aliens that may become established and provide information for the management of aliens.

Cumulative impacts:

Soil erosion, habitat loss, damage to wetlands and increased frequency of veld fires may all lead exacerbate this impact.

Residual impacts:

Residual impacts are expected to be very low if control measures are effectively applied

Nomination of a preferred power evacuation option

Substations

» *Option 1 and 2* each require a single substation for both phases which is to be located within natural habitat with relatively unique species composition and diversity for the site. If one of these options is selected, it is recommended that the substation site be shifted 200 m - 220 m to the north-west to within a degraded area. *Option 3* - requires two substations, one for each phase of the project. One substation is within natural habitat in moderate to poor condition and one is within a transformed area. *Option 4* - requires two substations, one for each phase of the project. Both of these substations are within transformed areas. Option 4 is therefore preferred as it appears to have the least impact on the natural environment, primarily because it does not affect any natural habitat (refer to Appendix E for further information).

Power lines

» *Options 1 and 2* lies adjacent to either an existing power line or an existing road. There is a small section of approximately 450 m and 200 m for options 1 and 2 respectively that cross through natural vegetation where there is no existing disturbance. Option 1 does not cross any wetlands, however option 2 crosses a small drainage line
» *Option 3 and 4* lie adjacent to an existing power line and cross through mostly transformed habitat. Both options cross drainage lines in four places (although for option 3 this is adjacent to an existing powerline).

Options 3 and 4 appear to have the least impact on the natural environment, primarily because they are aligned with existing linear infrastructure, or are positioned within transformed or degraded habitat and affect little natural habitat.

Implications for project implementation

» The section of new road between turbines 10 and 12 must be moved to avoid the hill across which it currently crosses.
» If substation Option 1 or Option 2 is selected, then the substation site should be shifted 200 m - 220 m to the north-west to within a degraded area.
» The vegetation type occurring in the study area (*Albany Coastal Belt)* is classified as Least Threatened based on rates of transformation and conservation. Only two plant species of minor conservation concern have a probability of occurring on site include neither of which are classified as threatened.
» Drainage lines (wetlands) should be avoided, where reasonable. The potential impacts of activities on site on these river systems need to be carefully managed. It is especially important that the Mtana estuary (very sensitive and is shown as having high conservation value and sensitivity in the ECBCP) is not affected by activities on site. Wetlands represent particularly vital natural corridors as they function both as wildlife habitat, providing resources needed for survival, reproduction and movement, and as biological corridors, providing for movement between habitat patches. Both functions are potentially critical to conservation of biological diversity as the landscape becomes increasingly fragmented into smaller, more isolated patches.
» Steep slopes can be problematic in constructing infrastructure because any impact can have an effect downslope from that point. Depending on the steepness and the length of the slope, particular areas may be more sensitive to disturbance than others. Any steep slopes are therefore considered to have elevated sensitivity. This applies primarily to the parts of the site in the south-western corner that overlook the main drainage lines that exit the site. Potential issues that may arise from development of these areas include erosion of substrates downslope and the impacts of stormwater runoff.
» Forests and wetlands are both protected under national legislation (National Forests Act and National Water Act respectively). Any impacts on these vegetation types would require a permit from the relevant National Department.
» All transformed and degraded areas on site are classified as having low sensitivity and conservation value.
» Most of the natural areas are classified as having moderate sensitivity and conservation value. This is because the vegetation has been quite heavily impacted upon by livestock grazing and other activities on site and is in moderate to poor condition.
» There is one small area near the centre of the site with good quality grassland and relatively unique species composition. This is on a small hill which is the highest point on site. Due to the elevated position of this hill, the ecological conditions have

allowed for the development of plant communities that are different to the surrounding areas. The condition and unique species composition of this small area has resulted in this area being classified as having high sensitivity and conservation value, and should be avoided.

6.4.2 Assessment of Potential Avifaunal Impacts

The study area is not located close to any recognised national Important Bird Areas (Barnes 1998); however it does support a relatively diverse range of avifauna, including some moderately important populations of rare, threatened and/or endemic species.

The development footprint will not impinge significantly on any major bird fly-ways or unique landscape features, but may affect an area of open savanna/grassland habitat which supports populations of regionally or nationally threatened (and impact susceptible) bird species. These are likely to occur within or close to the turbine arrays and the proposed facility may have a detrimental effect on these birds, particularly during its operational phase (i.e. through collisions). This is likely to have a significant, long-term impact on the avifauna of the area, and may have a negative effect on key rare, red-listed and/or endemic species. The most obvious and immediate negative impacts are likely to be on bustards and cranes, on a variety of soaring raptors, and on commuting wetland species. These birds may be disturbed by construction of the facility, may lose foraging habitat to the development footprint or be displaced from the area by the operating turbines (bustards and cranes), or may suffer mortalities in collisions with the turbine blades and power lines (bustards, cranes, raptors, wetland birds). The significance of these impacts, which may also impact on other priority species, can be reduced to an acceptable and sustainable level through the implementation of mitigation measures.

Impacts of the proposed Riverbank Wind Energy Facility are most likely to be manifest in the following ways:

» Disturbance and displacement of resident/breeding large terrestrial birds (especially Denham's Bustards, White-bellied Korhaan and Grey-crowned Crane) from nesting and/or foraging areas by construction and/or operation of the facility, and /or mortality of these species in collisions with the turbine blades or associated new power lines while commuting between resource areas (croplands, nest sites, roost sites/wetlands).
» Displacement of resident/visiting raptors (especially Secretarybird, African Marsh Harrier, Lanner Falcon and possibly Black Harrier) from foraging areas by construction and/or operation of the facility, and /or mortality of these species in collisions with the turbine blades or associated new power lines while slope-soaring along the high-lying ridges or hunting in the valleys, or by electrocution when perched on power infrastructure.

» Displacement of wetland species (especially Caspian Tern, Great White Pelican, and Black Stork) from regular commute routes between resource areas along the coast, and/or mortality of these species in collisions with the turbine blades or associated new power lines.

Impact table summarising the significance of impacts on avifauna (with and without mitigation)

Nature: Disturbance Noise, movement and temporary occupation of habitat during the construction phase is likely to impact all birds in the area to some extent, but sensitive, sedentary and/or habitat specific species will most adversely affected. During the operational phase noise and movement generated by operating turbines and maintenance activities is sufficient to disturb priority species, causing displacement from the area, adjustments to commute routes with energetic costs, or otherwise affecting nesting success or foraging efficiency.		
	Without mitigation	***With mitigation***
Extent	Local (2)	Local (2)
Duration	Short (1) - Lifetime of the facility (4)	Short (1) - Lifetime of the facility (4)
Magnitude	Moderate (6)	Moderate (5)
Probability	Highly probable (4) - Definite (5)	Highly probable (4) - Definite (5)
Significance	**Moderate (45 - 48)**	**Moderate (40 - 44)**
Status (positive or negative)	Negative	
Reversibility	Low - Medium	Low - High
Irreplaceable loss of resources	Possible	Probably not/possible
Can impacts be mitigated	To an extent	
Mitigation: » During the construction phase mitigation would typically include scheduling construction activities around avian breeding and/or movement schedules (actual timing to be refined by the results of pre-construction monitoring), lowering levels of associated noise, and reducing the size of the inclusive development footprint. » During the operational phase mitigation would include scheduling activities (i.e. maintenance) in relation to avian breeding and/or movement schedules (actual timing to be refined by the results of pre-construction monitoring), and lowering levels of noise.		
Cumulative impacts: During the construction phase cumulative impacts will result if other wind energy developments are under construction at the same time. During the operational phase cumulative impacts will occur as a result of additional wind energy facility developments in the project area.		
Residual impacts: Some priority species may move away regardless of mitigation during the construction phase, and during the operational phase some priority species may be permanently lost from the area.		

Nature: Habitat loss Habitat loss and/or destruction of habitat for priority species may be temporary (i.e. resulting construction activities), or permanent (i.e. the area occupied by the completed development).		
	Without mitigation	***With mitigation***
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low-Moderate (5)	Low (4)
Probability	Definite (5)	Definite (5)
Significance	**Moderate (55)**	**Moderate (50)**
Status (positive or negative)	Negative	
Reversibility	Low	
Irreplaceable loss of resources	Possible	Probably not
Can impacts be mitigated	Yes	
Mitigation: » Minimise habitat destruction caused by the construction of the facility by keeping the lay-down areas as small as possible. » Build as few temporary roads as possible. » Reduce the final extent of developed area to a minimum.		
Cumulative impacts: Cumulative impacts will occur if additional wind energy facilities are developed in the area as this will increase habitat losses.		
Residual impacts: Some species may be permanently lost to the area regardless of mitigation.		

Nature: Mortality Collision of priority species with the wind turbine blades and/or any new power lines, or electrocution of the same on new power infrastructure.		
	Without mitigation	***With mitigation***
Extent	Local (2)	Local (1)
Duration	Lifetime of the facility (4)	Lifetime of the facility (4)
Magnitude	Medium - High (7)	Medium (5)
Probability	Probable (3)	Improbable (2)
Significance	**Moderate (42)**	**Low - Moderate (20)**
Status (positive or negative)	Negative	
Reversibility	Low	
Irreplaceable loss of resources	Yes	Possibly not
Can impacts be mitigated	Yes	
Mitigation: Mitigation would include careful siting of turbines, painting turbine blades, marking power lines,		

using bird friendly power hardware, monitoring priority bird movements and collisions, turbine management sensitive to these data, radar assisted if necessary.
Cumulative impacts: Cumulative impacts will occur if more development takes place in the immediate area where habitat losses may increase exponentially.
Residual impacts: Some casualties may be incurred regardless of mitigation.

Nomination of a preferred power evacuation option

Options 1 and 2 would require a single power line to service both phases, whereas options 3 and 4 would require two power lines each. Therefore option 2 is preferred as this configuration requires the shortest length of new power line therefore minimising the potential collision risk.

Implications for project implementation

» The study area is not located close to any recognised national Important Bird Areas (Barnes 1998), but features a mix of bird-rich habitats – savanna, forest and wetlands – and hence supports a relatively diverse avifauna, including some moderately important populations of rare, threatened and/or endemic species.
» Careful and responsible implementation of the required mitigation measures should reduce construction and operational phase impacts to tolerable and sustainable levels.
» A comprehensive monitoring regime is required to fully determine the impacts of the facility on the broader avifauna of the area. This would be required to start prior to construction and during the operational phase ideally using a combination of occasional, direct observation of birds commuting or foraging through and around the wind energy facility, coupled with constant, remote tracking of avian traffic using specialised radar equipment.

Mitigation of these impacts will be best achieved in the following ways:

» Minimising the disturbance impacts associated with the construction of the facility, by abbreviating construction time, scheduling activities around avian breeding and/or movement schedules (actual timing to be refined by the results of pre-construction monitoring), and lowering levels of associated noise.
» Minimising habitat destruction caused by the construction of the facility by keeping the lay-down areas as small as possible, building as few temporary roads as possible, and reducing the final extent of developed area to a minimum.
» Minimising the disturbance impacts associated with the operation of the facility by abbreviating maintenance times, scheduling activities in relation to avian breeding and/or movement schedules (actual timing to be refined by the results of pre-construction monitoring), and lowering levels of associated noise.

- » Ensuring that lighting on the turbines is kept to a minimum, and is coloured (red or green) and intermittent, rather than permanent and white, to reduce confusion effects for nocturnal migrants.
- » Minimising the length of any new power lines installed, ensuring that all new lines are marked with bird flight diverters and that all new power infrastructure is adequately insulated and bird friendly in configuration.
- » Selecting Option 2 of the four proposed power line connection options, since this configuration requires the shortest length of new power line and/or new power line corridor, minimising the associated collision risk potential of the project.
- » Carefully monitoring the local avifauna pre- and post-construction, and implementing appropriate additional mitigation as and when significant changes are recorded in the number, distribution or breeding behaviour of any of the priority species listed in this report, or when collision or electrocution mortalities are recorded for any of the priority species listed in this report.
- » Additional mitigation might include re-scheduling construction or maintenance activities on site, shutting down problem turbines either permanently or at certain times of year or in certain conditions, or installing a 'DeTect' or similar radar tracking system to monitor bird movements and institute temporary shut-downs as and when required.

6.4.3 Assessment of Potential Geological Impacts

The proposed activity may potentially result in some direct impacts such as erosion and soil degradation. Indirect impacts may include increased siltation in waterways or dust pollution in the area surrounding the site. The severity or significance of the various impacts is related to the nature and extent of the activity and the existing geological conduction of various locations within the site. The table below summarises the site sensitivity in terms of water erosion susceptibility.

Sensitivity Level	Area/Terrain	Comments/Recommendations
High	Natural drainage lines/ watercourses including 32 m buffer from the edge of the riparian zone	This is regarded as a no-go area as severe erosion is presently taking place along some drainage lines.
Moderate	Rest of study area	Erosion is likely to occur when vegetation is disturbed.

Impact table summarising the significance of impacts on geology, soils, and erosion potential (with and without mitigation)

Nature: Soil degradation Excavation and removal of soil for roads and structures, affecting soil formation processes, hydrology, and ecosystems.		
	Without mitigation	***With mitigation***
Extent	Local (1)	Local (1)
Duration	Long term (4)	Medium term (3)
Magnitude	Moderate (6)	Low (4)
Probability	Definite (5)	Definite (5)
Significance	**Moderate (55)**	**Moderate (40)**
Status (positive or negative)	Negative	Negative
Reversibility	Partially reversible	Partially reversible
Irreplaceable loss of resources	Yes	Yes
Can impacts be mitigated	Yes, to a certain extent	
Mitigation: » Plan activity in areas of lower sensitivity where possible and rehabilitate soil in disturbance areas after construction. » Minimise size of disturbance areas and use existing access roads		
Cumulative impacts: Although soil removal for the proposed activity has a moderate significance, the cumulative impact of soil removal in the area is considered low due to undeveloped nature of the area.		
Residual impacts: Minor negative residual impacts are expected due to the slow regeneration of topsoil.		

Nature: Soil degradation Soil degradation may occur as a result of loosening, mixing, wetting, and compacting of in situ soil during earthworks, affecting soil formation processes, hydrology, and ecosystems.		
	Without mitigation	***With mitigation***
Extent	Local (1)	Local (1)
Duration	Medium term (3)	Short term (2)
Magnitude	Moderate (6)	Low (4)
Probability	Definite (5)	Definite (5)
Significance	**Moderate (50)**	**Moderate (35)**
Status (positive or negative)	Negative	
Reversibility	Irreversible	Reversible
Irreplaceable loss of resources	Yes	Minor
Can impacts be mitigated	Yes, to a certain extent	

Mitigation: » Utilise areas of lower sensitivity. » Minimise size of disturbance areas. » Use existing access roads where possible. » Design platforms and roads according to contours to minimise cut and fill operations.
Cumulative impacts: Although the impact for the proposed activity has only moderate-low significance, the cumulative impact of earthworks in the area is considered low due to the undeveloped nature of the area.
Residual impacts: Minor negative residual impacts are expected due to the slow regeneration of vegetation and topsoil.

Nature: Soil degradation Soil degradation may occur as a result of pollution by contaminants used in the construction phase (e.g. fuel, oil, and cement), affecting soil forming processes, and ecosystems.		
	Without mitigation	***With mitigation***
Extent	Local (1)	Local (1)
Duration	Medium term (2)	Very short term (1)
Magnitude	Low (4)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	**Low (21)**	**Low (12)**
Status (positive or negative)	Negative	
Reversibility	Partially reversible	
Irreplaceable loss of resources	Yes	Minor
Can impacts be mitigated	Yes, to a certain extent	
Mitigation: » Control use and disposal of potential contaminants or hazardous materials. » Remove contaminants and contaminated topsoil and replace topsoil in affected areas.		
Cumulative impacts: The cumulative impact of soil pollution in the area is considered moderate due to the severely degraded by mining operations to the south of the study area.		
Residual impacts: Minor negative residual impacts are expected due to the inherently slow regeneration of soil processes in and under the topsoil.		

Nature: Soil degradation Soil degradation may occur as a result of wind or water erosion which will affect the soil forming processes, agricultural potential, and hydrology of the site.		
	Without mitigation	***With mitigation***
Extent	Local (1)	Local (1)
Duration	Medium term (3)	Very short term (1)

Magnitude	Moderate (6)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Moderate (30)**	**Low (18)**
Status (positive or negative)	Negative	Negative
Reversibility	Practically irreversible	Practically irreversible
Irreplaceable loss of resources	Yes, moderate to low	Minor
Can impacts be mitigated	Yes	

Mitigation:

» Restrict construction activities to the confines of the construction camp.
» Implement effective erosion control measures.
» Carry out earthworks in phases to minimise exposed ground at any one time.
» Keep to existing roads, where practical, to minimise loosening of undisturbed ground.
» Protect and maintain bare slopes, excavations, and material stockpiles to minimise erosion and instability.

Cumulative impacts:

The cumulative impact of soil erosion in the area is considered low due to the undeveloped nature of the area.

Residual impacts:

Minor residual impacts are expected due to the localised movement of sediment and the inherently slow regeneration of soil processes.

Nature: Indirect impacts resulting from soil erosion

Indirect impacts on waterways in the area surrounding the site may result, particularly during the construction phase as a result of increased siltation in waterways in the area surrounding the site.

	Without mitigation	***With mitigation***
Extent	Regional (3)	Local (1)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Minor (2)
Probability	Highly probable (4)	Probable (3)
Significance	**Moderate (44)**	**Low (21)**
Status (positive or negative)	Negative	
Reversibility	Irreversible	
Irreplaceable loss of resources	Yes, low	
Can impacts be mitigated	Yes	

Mitigation:

» Install anti-erosion measures such as silt fences, geosynthetic erosion protection, and/or flow attenuation along watercourses below construction sites.
» No development should take place in or near water courses/natural drainage lines, as sediment transport is higher in these areas.

Cumulative impacts:
The cumulative impact of siltation in the area is considered low.
Residual impacts:
Residual impacts are expected in terms of minor localised movement of soil across the site.

Nature: Indirect impacts as a result of erosion Indirect impacts such as dust pollution from construction site may affect areas surrounding site.		
	Without mitigation	***With mitigation***
Extent	Regional (2)	Regional (2)
Duration	Very short term (1)	Very short term (1)
Magnitude	Moderate (6)	Low (4)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Moderate (36)**	**Low (28)**
Status (positive or negative)	Negative	
Reversibility	Irreversible	
Irreplaceable loss of resources	Yes, low	
Can impacts be mitigated	Yes	
Mitigation: » Install dust covers on stockpiles. » Use suitable gravel wearing course on access roads. » Apply straw bales or wet dusty denuded areas.		
Cumulative impacts: The cumulative impact of dust in the area is considered low.		
Residual impacts: Residual impacts are expected in terms of minor localised movement of soil across the site.		

Nomination of a preferred power evacuation option

Option 1 is preferred overall as the proposed power line would largely follow the existing access road and is preferred as it is deemed to have a lower impact on undisturbed ground. This option carries a low significance in terms of the potential impacts on the geological environment.

Implications for project implementation

» The most important geological issues are the direct impacts of soil degradation (including erosion of soil) from the area of activity (including the turbine sites, substations, access roads and power line routes). This would affect the ecosystems operating in the soil and the plant and animal species that depend on it for growth and survival.

» In terms of water erosion sensitivity, the natural drainage lines/watercourses including a 32 m buffer from the edge of the riparian zone are regarded as no-go areas as severe erosion is presently taking place along some drainage lines.
» Dust pollution from areas that are stripped of vegetation should not be underestimated and may attract negative response from neighbouring communities.
» Indirect impacts could include increased siltation in watercourses downstream caused by an increase in erosion from the site or increased dust pollution away from the site.
» A more detailed assessment of the soils and erosion potential of the site should be conducted during a detailed geotechnical investigation.

6.4.4 Assessment of Potential Impacts on Heritage Resources

Occasional scatters of predominantly Middle Stone Age (MSA) stone artefacts were observed within the already disturbed and eroded areas as well as dongas and man-made dam areas. It is unlikely that these stone tool scatters are *in situ* and are, therefore, considered to be in a secondary context. Although stone artefacts may occur *in situ* under the dense grassy vegetation cover over the entire area proposed for development, no sites containing any depth of deposit or other archaeological material associated with the stone tool artefacts were observed within the area. The proposed area for development is considered as having a medium-low cultural significance.

Impact table summarising the significance of impacts on heritage sites (with and without mitigation)

Nature: Loss of heritage resources Loss of stone artefact scatters and possible sites during the construction phase.	
	Without mitigation
Extent	Site specific (5)
Duration	Permanent (5)
Magnitude	High (10)
Probability	Highly probable (5)
Significance	**Moderate (50)**
Status (positive or negative)	Negative
Reversibility	No
Irreplaceable loss of resources	Yes
Can impacts be mitigated	Yes
Mitigation measures: » The grave and burial areas must be identified and cordoned off prior to the commencement of development so that no negative impact and vandalism occurs. » The possible Historical/Late Iron Age settlement and immediate surrounding area must be identified and cordoned off prior to development to avoid negative impact from the tracks to	

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

Nomination of a preferred power evacuation option

There is no preference for a specific power evacuation option from a heritage and/or archaeological perspective.

Implications for project implementation

» No Phase 2 Archaeological mitigation[15] is required for the proposed development to proceed.
» The modern grave and possible informal burials are protected by legislation and must be avoided to prevent any damage to these features.
» The possible Historical/Late Iron Age settlement and immediate surrounding areas must be identified and cordoned off prior to development to avoid negative impact from the tracks to be used.
» If concentrations of archaeological heritage material and human remains are uncovered during construction, all work must cease immediately and be reported to the Albany Museum and/or SAHRA so that systematic and professional investigation/ excavation can be undertaken.
» Construction managers/foremen must be informed before construction starts on the possible types of heritage sites, cultural material they may encounter, and the procedures to follow when they find sites.

6.4.5 Assessment of Potential Impacts on Palaeontology

In view of the nature of the field geology of the sedimentary units within the study area, the likelihood of well preserved fossils being found within the developmental footprint is regarded as 'extremely slim'. There is however a remote chance that some fossil forms like trace or invertebrate body fossil and possibly bone may be found during the development phase of foundation excavation, road building, or trenching.

[15] A Phase 2 Assessment would include a collection of heritage resource prior to construction activities.

Nature: Disturbance of paleontology resources Disturbance or destruction of valuable fossil heritage within the potentially fossiliferous lower Beaufort Group sediments		
	Without mitigation	***With mitigation***
Extent	International (5)	International (5)
Duration	Permanent (5)	Permanent (5)
Magnitude	Very high (10)	Very high (10)
Probability	Improbable (2)	Very Improbable (1)
Significance	**Moderate (40)**	**Low (20)**
Status (positive or negative)	Negative	
Reversibility	No	
Irreplaceable loss of resources	Yes	
Can impacts be mitigated	Yes	
Mitigation: Should substantial fossils be exposed during construction, the Environmental Control Officer (ECO) on site should safeguard these in situ. The Albany Museum or Rhodes University in Grahamstown and / or a professional paleontologist should be alerted as soon as possible so that appropriate mitigation measures can be implemented by a professional team.		
Cumulative impacts: Any construction activities have the potential to impact on the valuable fossil heritage.		
Residual impacts: No residual impacts are expected.		

Nomination of a preferred power evacuation option

There is no preference for a specific power evacuation option from a palaeontological perspective.

Implications for project implementation

» If at any stage during the construction phase any semblance of a fossil were to be observed, it would be vital to stop construction activities at that site, recover the fossil, and report the occurrence to the geological staff at either the Albany Museum or Rhodes University in Grahamstown.
» Generally fossils can be removed quickly and would therefore not delay or hinder construction operations.

6.4.6 Assessment of Potential Visual Impacts

The construction and operation of the proposed facility and its associated infrastructure will have a visual impact on the natural scenic resources and rural character of the study area. The potential visual impact on users of major and secondary roads in close

proximity to the proposed facility will be of high significance. The anticipated visual impact on residents of nearby towns will be of moderate significance, while the visual impact on settlements and homesteads is likely to be of high significance. Within the greater area, the potential visual affect sensitive visual receptors (i.e. tourists and visitors) and on the scenic nature and tourist potential will be of moderate to low significance respectively. The significance of the potential visual impact on conservation areas will also be moderate. Various ancillary infrastructure is expected to result in visual impacts of moderate (i.e. power line(s)) and low (i.e. substation(s), ancillary buildings, and access roads) significance. Secondary visual impacts related to lighting and construction may all be mitigated to low significance. The methodology used to determine these significance ratings is explained below.

Determine potential visual exposure

If the proposed wind energy facility and associated infrastructure were not visible, no impact would occur. Therefore a viewshed analyses was undertaken, to indicate the potential visibility (refer to Figure 6.5). This not only indicates areas from which the wind turbines would be visible (i.e. any number of turbines with a minimum of one turbine), but also indicates the potential frequency of visibility (i.e. how many turbines are exposed). The proposed facility would have a relatively large area of potential visual exposure due to the height of the wind turbines and their relatively elevated position within the landscape. The highest frequency of exposure is expected in the immediate vicinity (i.e. within 3 km) of the proposed facility, with lower frequencies along the river valleys. Further from the facility, the areas of visual exposure become more fragmented, especially to the north and west, where the increasingly hilly topography offers partial visual screening. The frequency of exposure remains generally moderate to high.

The number of observers and their perception of a structure determine the concept of visual impact. If there are no observers or if the visual perception of the structure is favourable to all the observers, there would be no visual impact. It was therefore necessary to identify areas of high viewer incidence and to classify certain areas according to the observer's visual sensitivity towards the facility (refer to Figure 6.6).

Viewer incidence is calculated to be the highest along the arterial roads (i.e. the R72 and to a lesser degree the R345) as well as the secondary roads within the study area (i.e. especially the gravel roads to Hamburg and eLalini). Commuters and tourists using these roads could be negatively impacted upon by visual exposure to the facility. Other than along the above roads, viewer incidence within a 10 km radius of the proposed facility is concentrated in a number of small towns. The remaining areas consist predominantly of agricultural land interspersed with vacant natural land and rural dwellings with a low occurrence of observers (i.e. homesteads and settlements).

Frequenters of the nature reserve and tourists are seen as potentially sensitive visual receptors upon which the construction of the facility could have a negative visual impact. The severity of the visual impact on these receptors decreases with increased distance from the proposed facility.

Determine the visual absorption capacity of the natural vegetation

This is the capacity of the receiving environment to absorb or screen the potential visual impact of the proposed facility. Site inspections have revealed that the visual absorption capacity (VAC) of the grassland; agricultural fields and degraded land would not influence the outcome of the visual impact assessment. The natural vegetation cover of thicket and bushland is mostly limited to the mountains, coastal dunes and the river valleys, and is low growing. Therefore, the VAC is deemed low to negligible for the study area.

Determine the visual impact index

The combined results of the visual exposure, viewer incidence/perception, and visual distance of the proposed wind energy facility are displayed on Figure 6.7 as a visual impact index. This index indicates the core area of potential visual impact within a 5 km radius of the proposed facility. This does not necessarily mean that the facility will be wholly visible.

» Potential areas of very high visual impact **within a 5 km radius** include most of the R72 and both secondary roads as well as the towns and of Wesley, Gcinisa, and Hamburg. In addition, the outskirts of Bodium and Tuwa and the following homesteads and settlements are likely to experience high visual impact, Daninge, Melville Park, New Bradford, Saxon Villa, Blue Krans, and River Bank.
» Limited stretches of the R72 and secondary roads between **5 km and 10 km** away are likely to experience a high visual impact due to the higher frequency of observers travelling along these roads.
» The outskirts of a few towns as well as a number of homesteads and settlements are likely to experience a high visual impact. These lie between **5 km and 10 km** away and include the following, Begha Mouth (northern outskirts), Kwa Ndaba (southern outskirts), Kampini (southern outskirts), Zikova (southern outskirts), Richmond, Grassridge, Doornkloof, Waterford, Shoreham, and Mazikhanye.
» **Beyond 10 km**, potential visual impacts within homesteads and settlements, and along all roads, are reduced to moderate where they occur at all. The outskirts of Xesi, eJojweni and Dowu are exposed to mostly low visual impact.
» Parts of the Mtana, Blue Krans, Ngculura Rivers traversing the site, and the Nyulutsi River forming the northern boundary to the proposed development site may experience a high visual impact within the radius of **5 km from the site**. Beyond 5 km the watercourses are generally screened by virtue of the topography.

» The inherent scenic beauty of the area, especially along the coastline which gives the area an inherent tourism potential may be affected (albeit one that has only been realised in very localised pockets along the coast (i.e. in this study area, the only known tourist destination in the exclusive Sandcastle Villa located some 3 km to the south near New Bedford). The Hamburg Nature Reserve falls within a general area that is likely to be exposed to a high to moderate visual impact.

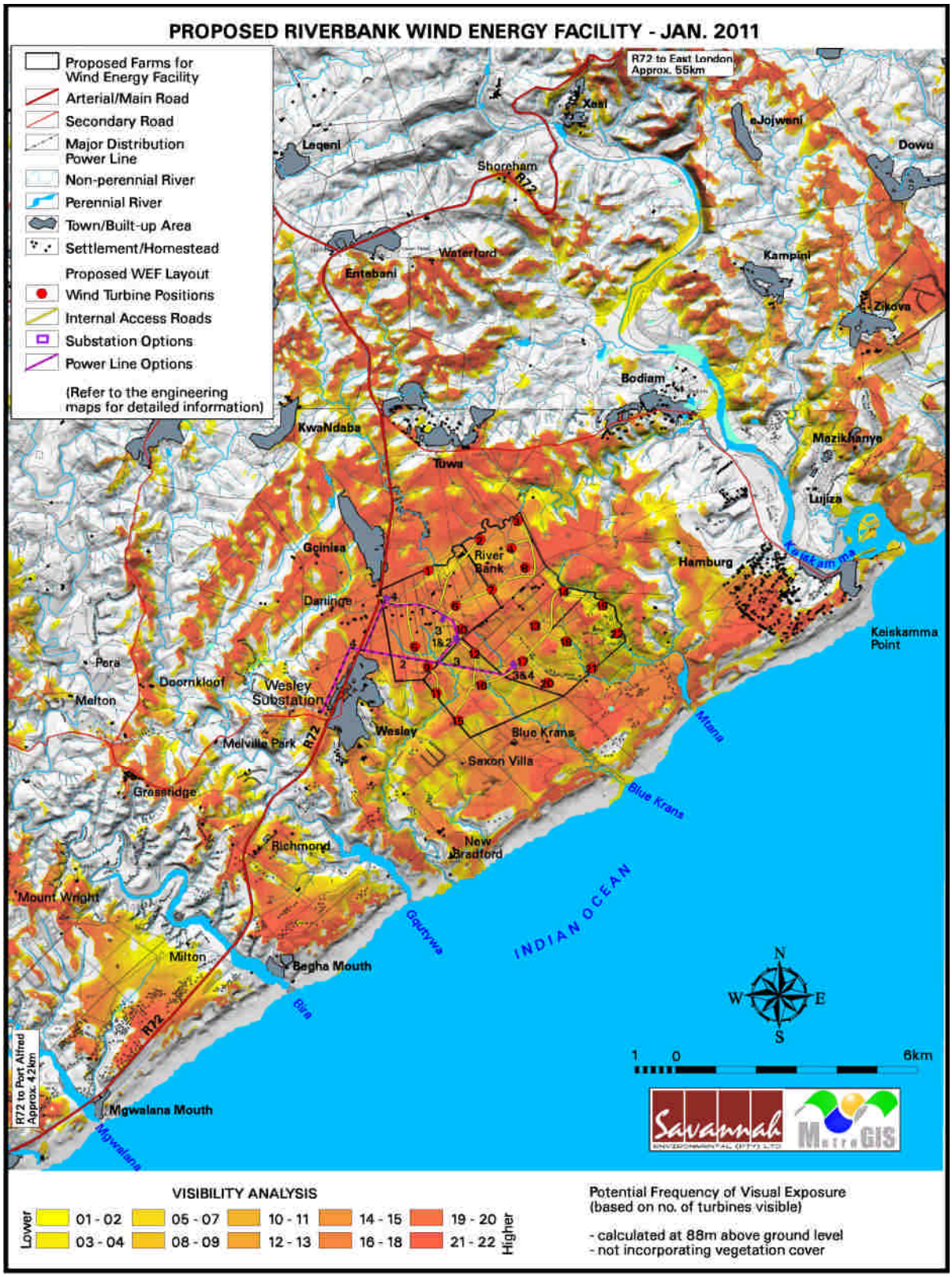


Figure 6.5: Potential visual exposure of the proposed facility - the dark orange areas indicates a high frequency (i.e. 21 - 22 whole turbines or parts thereof turbines may be visible), while the light yellow areas represent a low frequency (i.e. 1 - 2 whole turbines or parts thereof may be visible).

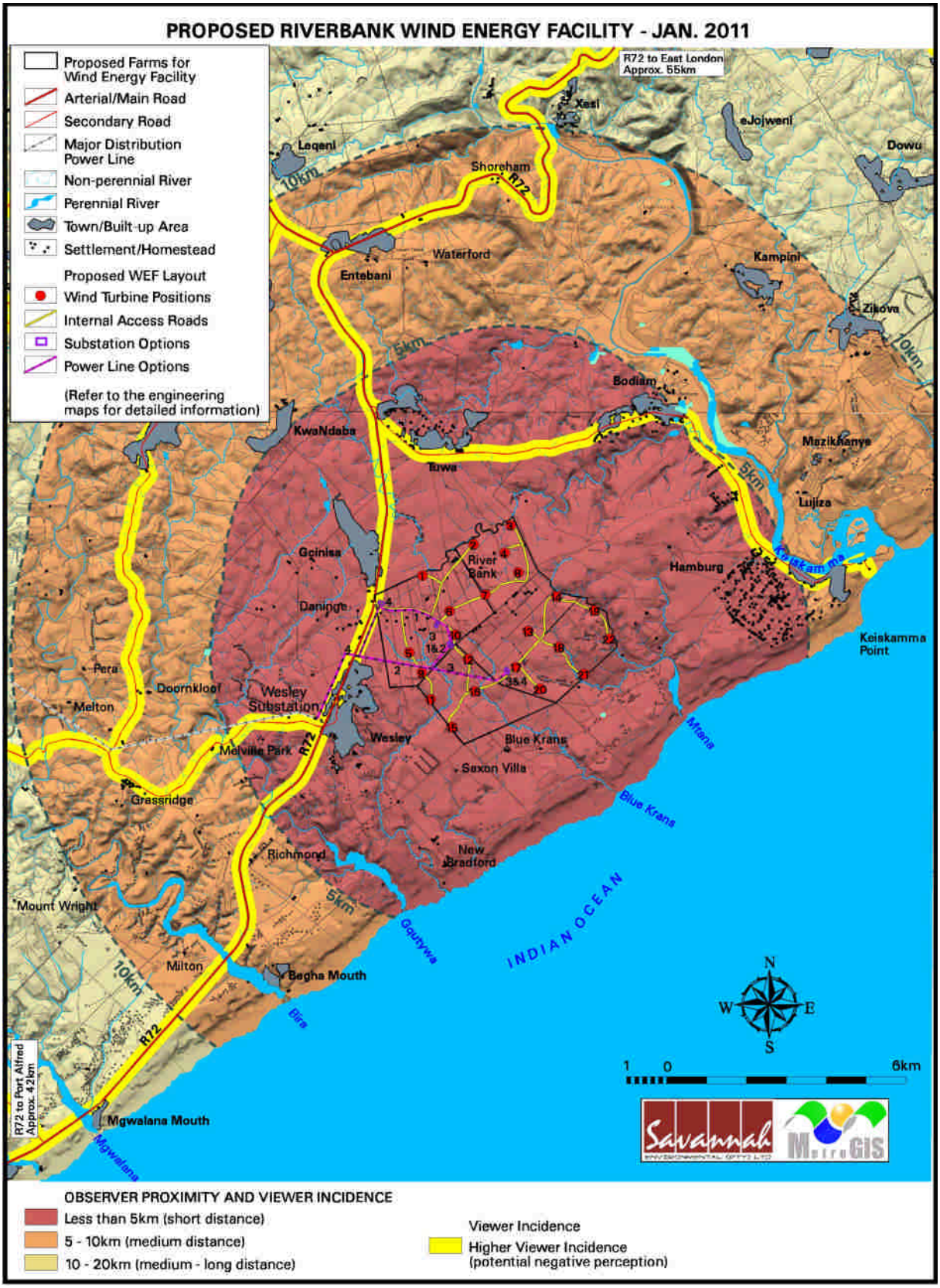


Figure 6.6: Observer proximity to the proposed facility and areas of high viewer incidence

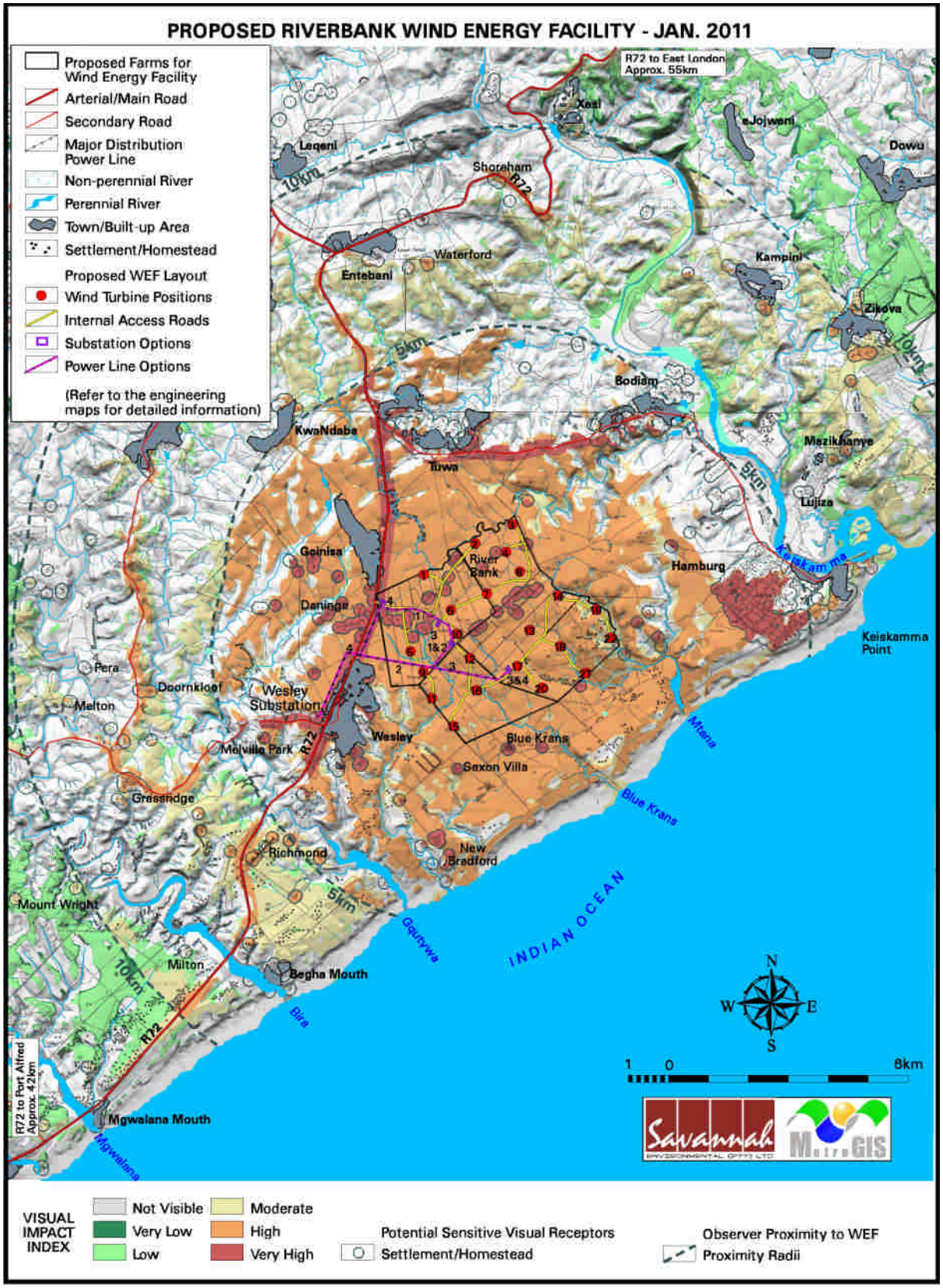


Figure 6.7: Visual impact index of the proposed facility

Impact table summarising the significance of impacts on visual aesthetics (with and without mitigation)

Nature: Potential visual impact on users of major roads (the R72) and secondary roads in close proximity to the proposed facility Visual impacts on arterial and secondary roads within a radius of 5 km of the proposed facility are expected to be of high significance.		
	Without mitigation	***With mitigation***
Extent	Local (4)	N/A
Duration	Long term (4)	N/A
Magnitude	Very high (10)	N/A
Probability	High (4)	N/A
Significance	**High (72)**	N/A
Status (positive or negative)	Negative / Positive	N/A
Reversibility	Recoverable (3)	N/A
Irreplaceable loss of resources	No	N/A
Can impacts be mitigated	No	
Mitigation: Decommissioning: removal of the wind turbines and ancillary infrastructure after 20 to 30 years.		
Cumulative impacts: The construction of 22 wind turbines together with the substation/s and other associated infrastructure may increase the cumulative visual impact of electricity related infrastructure within the region. However said infrastructure is of a distribution nature and is not of a high density and there this cumulative impact is not highly likely.		
Residual impacts: No residual impacts are expected as the visual impact will be removed after decommissioning.		

Nature: Potential visual impact on residents of built up centres in close proximity to the proposed facility The visual impact on the built up centres within a radius of 5 km of the proposed facility (i.e. the towns of Wesley, Gcinisa, and Hamburg) is expected to be of moderate significance.		
	Without mitigation	***With mitigation***
Extent	Local (4)	N/A
Duration	Long term (4)	N/A
Magnitude	High (8)	N/A
Probability	Probable (3)	N/A
Significance	**Moderate (48)**	N/A
Status (positive or negative)	Negative / Positive	
Reversibility	Recoverable (3)	N/A
Irreplaceable loss of resources	No	N/A

Can impacts be mitigated	No	N/A
Mitigation: Decommissioning: removal of the wind turbines and ancillary infrastructure after 20 to 30 years.		
Cumulative impacts: The construction of 22 wind turbines together with the substation/s and other associated infrastructure may increase the cumulative visual impact of electricity related infrastructure within the region. However said infrastructure is of a distribution nature and is not of a high density and there this cumulative impact is not highly likely.		
Residual impacts: No residual impacts are expected as the visual impact will be removed after decommissioning.		

Nature: Potential visual impact on residents of settlements and homesteads in close proximity to the proposed facility The visual impact on the settlements and homesteads within a radius of 5 km of the proposed facility is expected to be of high significance.		
	Without mitigation	***With mitigation***
Extent	Local (4)	N/A
Duration	Long term (4)	N/A
Magnitude	Very high (10)	N/A
Probability	High (4)	N/A
Significance	**High (72)**	N/A
Status (positive or negative)	Negative / Positive	N/A
Reversibility	Recoverable (3)	N/A
Irreplaceable loss of resources	No	N/A
Can impacts be mitigated	No	N/A
Mitigation: Decommissioning: removal of the wind turbines and ancillary infrastructure after 20 to 30 years.		
Cumulative impacts: The construction of 22 wind turbines together with the substation/s and other associated infrastructure may increase the cumulative visual impact of electricity related infrastructure within the region. However said infrastructure is of a distribution nature and is not of a high density and there this cumulative impact is not highly likely.		
Residual impacts: No residual impacts are expected as the visual impact will be removed after decommissioning.		

Nature: Potential visual impact on sensitive visual receptors (users of roads and residents of towns, settlements, and homesteads) within the region The visual impact on users of roads and on towns, settlements, and homesteads within the region (beyond the 50 km radius) is expected to be of moderate significance.		
	Without mitigation	***With mitigation***
Extent	Regional (3)	N/A
Duration	Long term (4)	N/A
Magnitude	High (8)	N/A
Probability	Probable (3)	N/A
Significance	**Moderate (45)**	N/A
Status (positive or negative)	Negative / Positive	N/A
Reversibility	Recoverable (3)	N/A
Irreplaceable loss of resources	No	N/A
Can impacts be mitigated	No	N/A
Mitigation: Decommissioning: removal of the wind turbines and ancillary infrastructure after 20 to 30 years.		
Cumulative impacts: The construction of 22 wind turbines together with the substation/s and other associated infrastructure may increase the cumulative visual impact of electricity related infrastructure within the region. However said infrastructure is of a distribution nature and is not of a high density and there this cumulative impact is not highly likely.		
Residual impacts: No residual impacts are expected as the visual impact will be removed after decommissioning.		

Potential visual impact on heritage and tourism initiatives in close proximity to the proposed facility Tourist destinations in close proximity to the proposed facility (i.e. within 5 km) include the beach front and the rivers (which hold the potential for tourism development) and the Sandcastle Villa. In addition, the town of Hamburg lies on the *Makana Heritage Route* and the R72 forms part of the so-called *Sunshine Route* which stretches from Port Elizabeth to East London.		
	No mitigation	***With mitigation***
Extent	Local (4)	N/A
Duration	Long term (4)	N/A
Magnitude	Very high (10)	N/A
Probability	Probable (3)	N/A
Significance	**Moderate (54)**	N/A
Status (positive or negative)	Negative	N/A
Reversibility	Recoverable (3)	N/A
Irreplaceable loss of resources	No	N/A

Can impacts be mitigated	No	N/A
Mitigation: Decommissioning: removal of the wind turbines and ancillary infrastructure after 20 to 30 years.		
Cumulative impacts: The construction of 22 wind turbines together with the substation/s and other associated infrastructure may increase the cumulative visual impact of electricity related infrastructure within the region. However said infrastructure is of a distribution nature and is not of a high density and there this cumulative impact is not highly likely.		
Residual impacts: No residual impacts are expected as the visual impact will be removed after decommissioning.		

Potential visual impact on heritage and tourism initiatives within the region The potential visual impact on the *Sunshine Tourist Route Makana Heritage Route*, as well as on the scenic nature and sense of place of potential tourist destinations (i.e. the beaches and rivers) is expected to be of low significance beyond a 5 km radius of the proposed facility.		
	No mitigation	***With mitigation***
Extent	Regional (3)	N/A
Duration	Long term (4)	N/A
Magnitude	High (8)	N/A
Probability	Improbable (2)	N/A
Significance	**Low (30)**	N/A
Status (positive or negative)	Negative	N/A
Reversibility	Recoverable (3)	N/A
Irreplaceable loss of resources	No	N/A
Can impacts be mitigated	No	N/A
Mitigation: Decommissioning: removal of the wind turbines and ancillary infrastructure after 20 to 30 years.		
Cumulative impacts: The construction of 22 wind turbines together with the substation/s and other associated infrastructure may increase the cumulative visual impact of electricity related infrastructure within the region. However said infrastructure is of a distribution nature and is not of a high density and there this cumulative impact is not highly likely.		
Residual impacts: No residual impacts are expected as the visual impact will be removed after decommissioning.		

Nature: Potential visual impact on conservation areas within the region The Hamburg Nature Reserve, which in turn forms a part of the larger East London Coastal Nature Reserve, is situated within a 10 km radius of the proposed facility. It is not likely that the reserve has any infrastructure, or that it is able to accommodate any tourists or local users. Nonetheless, tourists and local users may be accommodated in the future.

	No mitigation	***With mitigation***
Extent	Regional (3)	N/A
Duration	Long term (4)	N/A
Magnitude	High (8)	N/A
Probability	Improbable (2)	N/A
Significance	**Low (30)**	N/A
Status (positive or negative)	Negative	N/A
Reversibility	Recoverable (3)	N/A
Irreplaceable loss of resources	No	N/A
Can impacts be mitigated	No	N/A
Mitigation: Decommissioning: removal of the wind turbines and ancillary infrastructure after 20 to 30 years.		
Cumulative impacts: The construction of the substation/s and other associated infrastructure may increase the cumulative visual impact of electricity related infrastructure within the region. However said infrastructure is of a distribution nature and is not of a high density and there this cumulative impact is not highly likely.		
Residual impacts: No residual impacts are expected as the visual impact related to this infrastructure will be removed after decommissioning.		

Nature: Potential visual impact of the substation(s) and ancillary buildings
The substation(s) and other ancillary buildings could represent a visual impact. Areas of vegetation will need to be removed for these structures, which are in essence industrial type structures in a natural environment. Although no dedicated viewshed has been generated for the above infrastructure, it will all be located within the proposed facility development footprint, and will be overshadowed by the much taller wind turbine structures. It is thus expected that the area of potential visual exposure will lie within that of the primary infrastructure (i.e. the turbines). This anticipated impact is likely to be of low significance.

	No mitigation	***With mitigation***
Extent	Local (4)	N/A
Duration	Long term (4)	N/A
Magnitude	Low (4)	N/A
Probability	Improbable (2)	N/A
Significance	**Low (24)**	N/A
Status (positive or negative)	Negative	N/A
Reversibility	Recoverable (3)	N/A
Irreplaceable loss of resources	No	N/A
Can impacts be mitigated	No	N/A

Mitigation:
Decommissioning: removal of the wind turbines and ancillary infrastructure after 20 to 30 years.
Cumulative impacts:
The construction of the substation/s and other associated infrastructure may increase the cumulative visual impact of electricity related infrastructure within the region. However said infrastructure is of a distribution nature and is not of a high density and there this cumulative impact is not highly likely.
Residual impacts:
No residual impacts are expected as the visual impact related to this infrastructure will be removed after decommissioning.

Nature: Potential visual impact of the power lines

No dedicated viewshed has been generated for the power line options. However, for all options, those sections of the alignment within the proposed development footprint will be overshadowed by the taller wind turbine structures. The anticipated visual impact of the new power line is likely to be of moderate significance.

	No mitigation	***With mitigation***
Extent	Regional (3)	N/A
Duration	Long term (4)	N/A
Magnitude	Moderate (6)	N/A
Probability	High (4)	N/A
Significance	**Moderate (52)**	N/A
Status (positive or negative)	Negative	N/A
Reversibility	Recoverable (3)	N/A
Irreplaceable loss of resources	No	N/A
Can impacts be mitigated	No	N/A

Mitigation:
Decommissioning: removal of the wind turbines and ancillary infrastructure after 20 to 30 years.
Cumulative impacts:
The construction of the power line(s) may increase the cumulative visual impact of electricity related infrastructure within the region. However said infrastructure is of a distribution nature and is not of a high density and there this cumulative impact is not highly likely.
Residual impacts:
No residual impacts are expected as the visual impact related to the power line(s) will be removed after decommissioning of the power line infrastructure.

Nature: Potential visual impact of the internal access roads Within the development footprint, access roads will be required, firstly to construct each turbine (construction phase), and secondly to maintain the turbines (operational phase). This network of roads has the potential of manifesting as a network of landscape scarring, and a potential visual impact within the viewshed areas.		
	No mitigation	***With mitigation***
Extent	Local (4)	Local (4)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Moderate (6)
Probability	Probable (3)	Improbable (2)
Significance	**Moderate (42)**	**Low (28)**
Status (positive or negative)	Negative	Negative
Reversibility	Recoverable (3)	Recoverable (3)
Irreplaceable loss of resources	No	No
Can impacts be mitigated	No	No
Mitigation: » *Construction*: comprehensive rehabilitation. » *Operation*: ongoing maintenance.		
Cumulative impacts: No cumulative impacts are expected in terms of the internal access roads.		
Residual impacts: No residual impacts are expected.		

Nature: Potential visual impact of lighting on visual receptors in close proximity of the proposed facility Lighting related impacts include the use of night and security lighting, glare light, and sky glow (refer to Appendix J). This anticipated impact is likely to be of moderate significance, and may be mitigated to low**.**		
	No mitigation	***With mitigation***
Extent	Local (4)	Local (4)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Moderate (6)
Probability	High (4)	Improbable (2)
Significance	**Moderate (56)**	**Low (28)**
Status (positive or negative)	Negative	
Reversibility	Recoverable (3)	
Irreplaceable loss of resources	No	
Can impacts be mitigated	No	

Mitigation: *Planning*: pro-active design and planning *Decommissioning*: removal of the wind turbines and ancillary infrastructure after 20 to 30 years.
Cumulative impacts: The construction of 22 wind turbines together with the substation/s and other associated infrastructure will increase the cumulative visual impact of electricity related infrastructure within the region. This is relevant in light of the existing power line infrastructure already present in the area, albeit limited in extent and scale.
Residual impacts: No residual impacts are expected as the visual impact of the lighting infrastructure will be removed after decommissioning.

Nature: Potential visual impact of construction This will impact on visual receptors in close proximity of the proposed facility		
	No mitigation	***With mitigation***
Extent	Local (4)	Local (4)
Duration	Very short term (1)	Very short term (1)
Magnitude	Moderate (6)	Low (4)
Probability	High (4)	Improbable (2)
Significance	**Moderate (44)**	**Low (18)**
Status (positive or negative)	Negative	
Reversibility	Recoverable (3)	
Irreplaceable loss of resources	No	
Can impacts be mitigated	No	
Mitigation: *Construction*: management of the construction site and rehabilitation.		
Cumulative impacts: The construction of 22 wind turbines together with the substation/s and other associated infrastructure will increase the cumulative visual impact of electricity related infrastructure within the region. This is relevant in light of the existing power line infrastructure already present in the area, albeit limited in extent and scale.		
Residual impacts: No residual impacts are expected as the visual impact of the lighting infrastructure will be removed after decommissioning.		

Photo simulations

Photo simulations were undertaken (in addition to the above spatial analyses) in order to illustrate the potential visual impact of Riverbank Wind Energy Facility consisting of 22 turbines; within the receiving environment (refer to Figures 6.8 – 6.14).

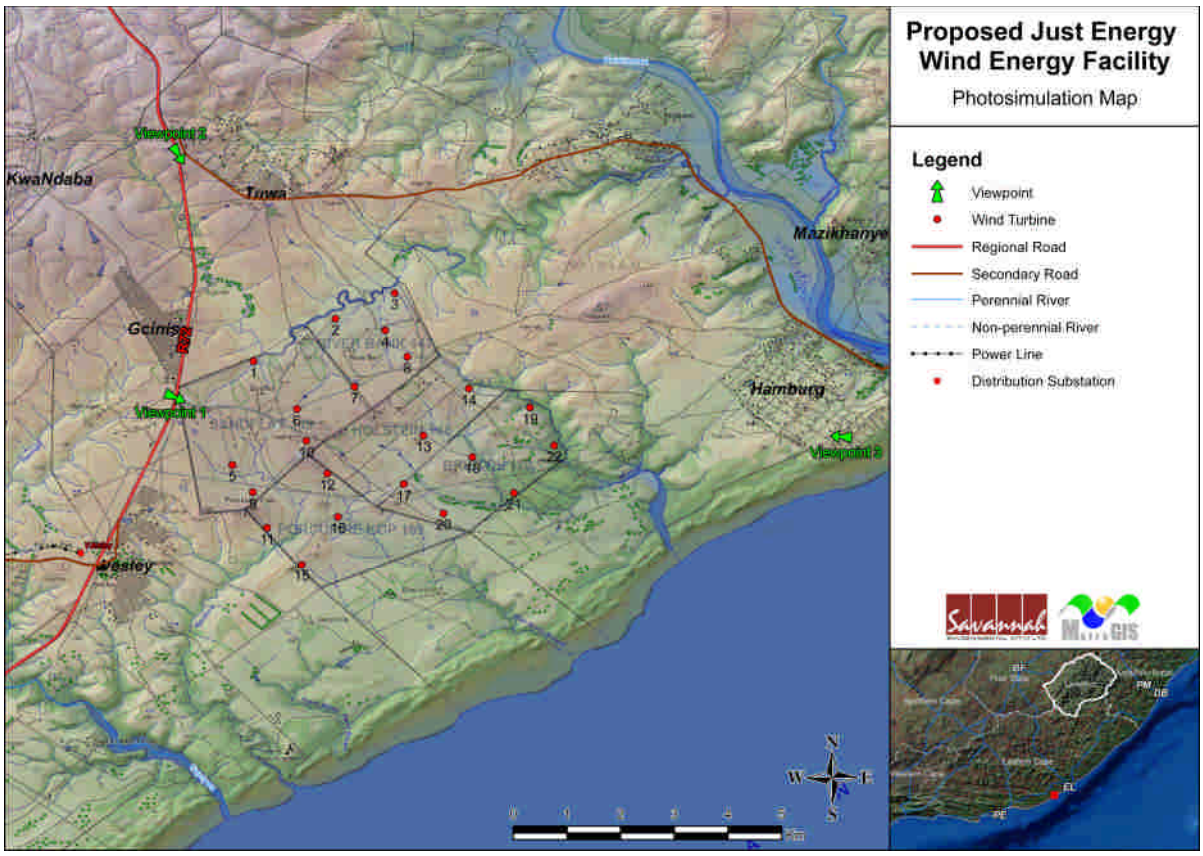


Figure 6.8: Photo simulations map indicating the vantage point where photo simulations were undertaken

The purpose of the photo simulation exercise is to support the findings of the visual impact assessment, and is not an exercise to illustrate what the facility will look like from all directions.

» ***View 1 (short distance view)*** - Viewpoint 1 is located just to the south of Gcinisa where the R72 passes the town. This position is indicative of what will be seen of the facility from the west; particularly while travelling either north or south along the R72. The viewing direction is east south-easterly and roughly 17 turbines may be fully to partially visible in the landscape. This view is representative of a short distance visual experience that travellers and residents (of Gcinisa particularly) moving between Wesley and East London will have of the proposed facility.

» ***Viewpoint 2 (short - medium distance view)*** - Viewpoint 2 is located on the R72 at the junction of the secondary road to Hamburg. This position is set a medium

distance from (5 km) to the closest turbines and is indicative of what will be seen from the north of the proposed facility while travelling on the R72 and secondary road. The viewing direction is south-easterly and roughly 21 turbines may be fully to partially visible in the landscape. This view is representative of a short to medium distance visual experience that travellers moving between Wesley and East London, as well as those travelling towards Hamburg, will have of the proposed turbines.

» ***View 3 (medium distance view) -*** Viewpoint 3 is located on a hill in the south of Hamburg at approximately 96 meters above sea level. This position is indicative of what will be seen from a medium distance, by residents living in the south of Hamburg. Persons utilising the high-lying sections of the Hamburg Nature Reserve will also have a similar view of the proposed facility. The viewing direction is westerly and roughly 21 turbines may be fully to partially visible in the landscape.

Figure 6.9: Pre-construction panoramic overview from Viewpoint 1

Figure 6.10: Post-construction panoramic overview from Viewpoint 1

Figure 6.11: Pre-construction panoramic overview from Viewpoint 2

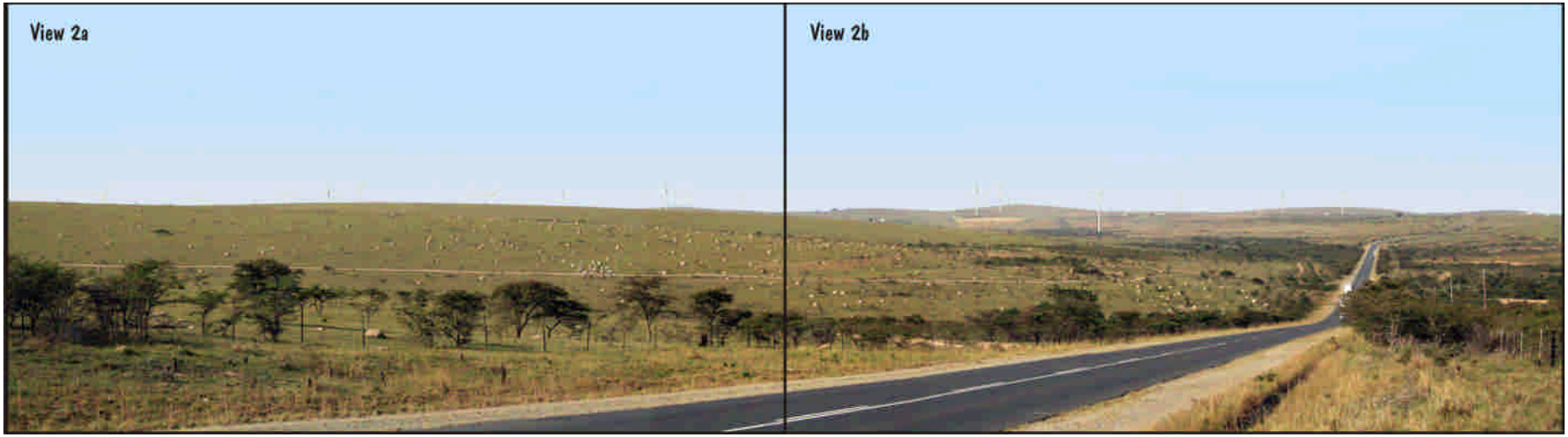


Figure 6.12: Post-construction panoramic overview from Viewpoint 2

Figure 6.13: Pre-construction panoramic overview from Viewpoint 3

Figure 6.14: Post-construction panoramic overview from Viewpoint 3

Refer to the Visual Impact Assessment (Appendix J) for further discussion of the photo simulations.

Nomination of a preferred power evacuation option

No dedicated viewshed has been generated for the power line options. However, for all options, those sections of the alignment within the proposed development footprint will be overshadowed by the taller wind turbine structures. Furthermore, those sections of the power line alignments (all options) situated outside of the development footprint follow existing power line corridors. In general, placing the new infrastructure adjacent to existing infrastructure of a similar nature is considered preferable from a visual perspective, as the it allows for the consolidation of visual impacts (i.e. the existing infrastructure 'absorbs' some of the visual impact of the new infrastructure).

The above two factors being equal from a visual perspective, a comparison of the 4 options is made based on 2 other factors, namely:

» The extent (length) of the new power line infrastructure required, and
» The scale of the required power line towers (a larger tower would be required for the 66kV connection).

In this respect, options 1 and 2 are favoured, as these entail only one power line to a single substation serving both phases 1 and 2 of the proposed facility. Of these two, option 2 is favoured from a visual perspective as this is a 22 kV connection with a smaller power line tower required.

Implications for project implementation

» After mitigation, the potential visual impact on users of major and secondary roads in close proximity of the proposed facility, as well as on residents of nearby homesteads and settlements, will be of high significance (i.e. whole turbines or parts thereof will be visible).
» Within the greater region, the potential visual impact on sensitive visual receptors, and on the sense of place of tourist routes and destinations, will be of medium significance. The significance of the potential visual impact on protected areas in close proximity of the facility (0 – 10 km) will also be medium.
» The various ancillary infrastructure is expected to result in visual impacts of medium to low significance.
» This anticipated visual impact is not, however, considered a fatal flaw from a visual perspective, considering the relatively low incidence of visual receptors in the region and the contained area of potential visual exposure. Furthermore, it is the opinion of the author that this impact is not likely to detract from the regional tourism appeal, numbers of tourists or tourism potential of the existing centres.
» Roads must be carefully planned, taking due cognisance of the topography. Roads should be laid out along the contour wherever possible and should never traverse slopes at 90 degree angles. Construction of roads should be undertaken properly, with adequate drainage structures in place to forego potential erosion problems.

» A lighting engineer should be consulted to assist in the planning and placement of light fixtures in order to reduce visual impacts associated with glare and light trespass. In addition, the possibility of motion activated security lighting should be investigated. This will allow a predominantly dark site to be lit only as required.

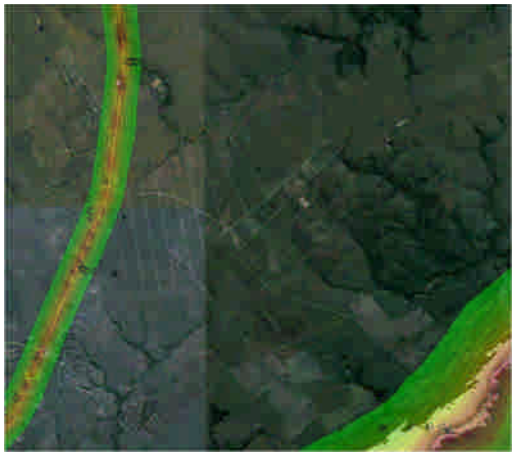
6.4.7 Assessment of Potential Noise Impacts

Noise can be defined as "unwanted sound," and an audible acoustic energy that adversely affects the physiological and/or psychological well-being of people, or which disturbs or impairs the convenience or peace of any person.

SANS 10103 addresses the issues concerning environmental noise and provides a guideline for estimating community response to an increase in the general ambient noise level caused by an intruding noise. Ambient (background) noise levels were measured during the day and night time in accordance with SANS 10103:2003[16]. From the data obtained, it can be seen that the ambient daytime sound levels range between 35 dBA to 51 dBA. Most of the ambient day-time noise comes from the provincial road in the area, although the noise due to wave action of the ocean was also considered. A noise level of 65 dBA was assumed in the area where waves break, although it should be noted that during times when wind is blowing, increased turbulence will result in significantly higher noise levels. Other noise sources were not added to this ambient sound map, which would typically include dogs barking and farm animals; radios or TVs playing in the background; people speaking and other activities, such as farming activities (refer to Figure 6.15).

Night time ambient sound levels range between 35 dBA to 55 dBA. The R72 provincial road cannot be excluded as a potential noise source at night. Another noise source is the noises of animals in the surrounding community and dwellings (refer to Figure 6.16).

[16] Unfortunately, current regulations and standards do not consider changing ambient (background) sound levels due to natural events, such as can be found near the coast or areas where wind-induced noises are prevalent.



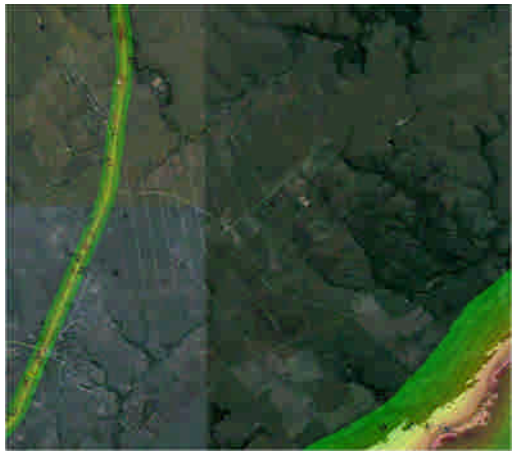


Figure 6.15 and 6.16: Daytime and night-time ambient noise profile for the site and area surrounding the site

Construction phase noise

Increased noise levels are directly linked with the various activities associated with the construction of the facility and related infrastructure (refer to Figures 6.17). Even though construction activities are projected to take place only during day time, it might be required at times that construction activities take place during the night (i.e. concrete pouring, and working late due to time constraints).

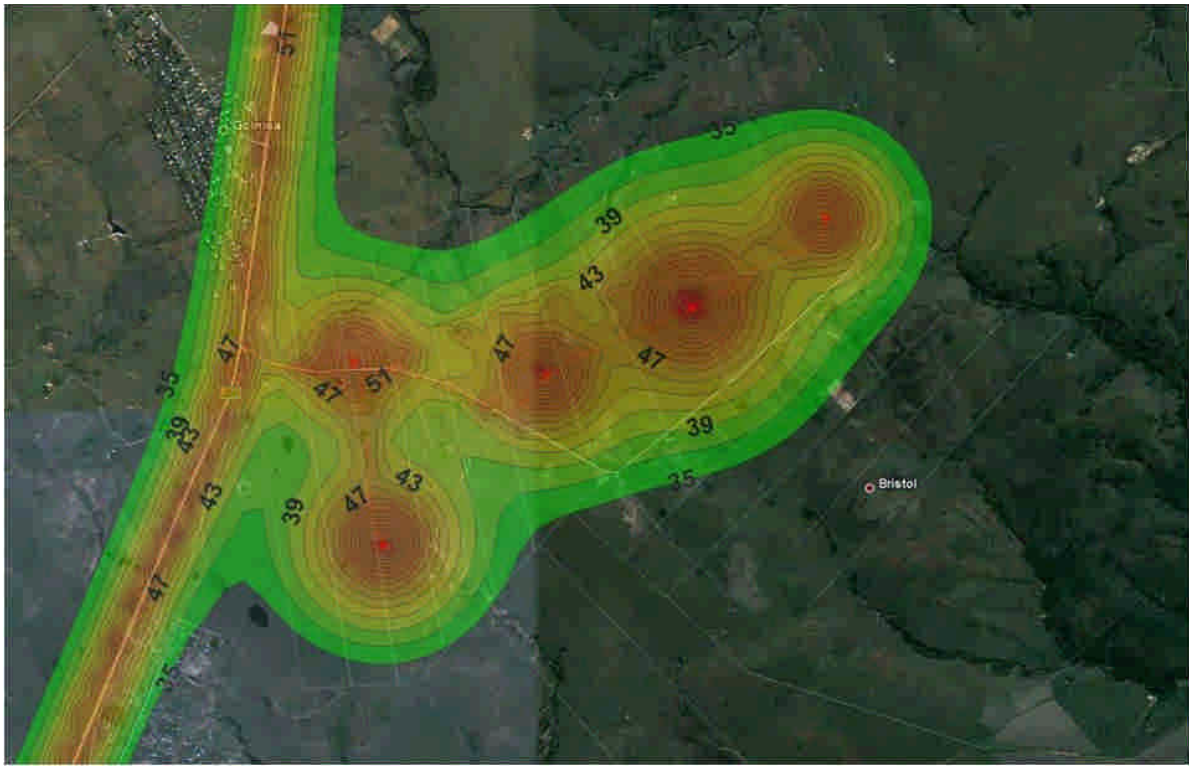


Figure 6.17: Construction noise - projected change in ambient sound levels.

Operational phase noise

During the operational phase, typical day time activities would include the operation of the various wind turbines; and maintenance activities (relative insignificant noise source) which will result in a change in the ambient noise levels (refer to Figure 6.18). However, the day time period (working day) was not considered for the EIA because noise generated during the day by the facility is generally masked by other noises from a variety of sources surrounding potential sensitive receptors.

However, times when a quiet environment is desired (at night for sleeping, weekends etc.) noise levels are more critical. The time investigated therefore would be the quiet period, normally associated with the 22:00 – 06:00 slot. Maintenance activities would therefore not be considered, concentrating on the ambient sound levels created due to the operation of the various wind turbine generators at night.

Figure 6.18: Change in ambient sound levels during the operational phase

The noise emissions into the environment from the various sources as defined by the project developer were calculated for the construction and operational phase in detail, using the sound propagation model described in SANS 0357.

» The ambient noise level would not exceed the acceptable night time rating levels (wind speeds less than 6 m/s, else wind induced noise levels start to play a significant role).

» Changes in ambient sound levels are projected to be medium, being less than 6 dBA.
» The operation of the wind turbines will slightly add to the acoustical energy in the low frequencies. However most of the acoustical energy in the low frequencies is due to the wind induced noise.
» While the wind turbines are generally relatively close to a number of potentially sensitive receptors (520 – 550 meters), the layout is such that the distances between different wind turbines is significant, being between 600 and as much as 1,120 meters (distance between one wind turbine and the closest other wind turbine). The result is that cumulative effects from adjacent wind turbines are kept to the minimum.

Impact table summarising the significance of impacts on noise levels

Nature: Numerous simultaneous construction activities that could impact on potential sensitive receptors. Potential noise sources during the construction phase will originate from: » General work at the workshop area; » Surface preparation prior to civil work; » Preparation of foundation area; » Pouring and compaction of foundation concrete; » Erecting of the wind turbine generator; and » Traffic on the site. There will be smaller equipment, but the addition of the general noise source (at each point) covers most of these noise sources. All equipment would be operating under full load (generate the most noise). Atmospheric conditions would be ideal for sound propagation. The noise impact assessment presumed the following equipment is to be used on site: » 1x bulldozer » 1x grader » 1x front-end loader and/or 1x excavator » 2x electric generator/air compressor and vibrators » 1x TLB » 1x mobile concrete batching plant/truck » 2x cranes » 2x load haul dumpers » 5x light delivery vehicles/people carriers (travelling onsite)		
	Without mitigation	**With mitigation**
Extent	Regional (3)	N/A
Duration	Long terms (4)	
Magnitude	Low – High (2 – 10)	
Probability	Total projected ambient noise levels relatively low. Change in ambient sound levels high due to low ambient noise levels assumed.	

	Normal daily activities would likely mask all construction related noises. **Improbable (1) – Likely (3)**	
Significance	**Moderate (45)** Worse case for PSR3 and PSR4	
Status (positive or negative)	Negative	
Reversibility	High	
Irreplaceable loss of resources	N/A	
Can impacts be mitigated	Yes	

Mitigation:

» Ensure a good working relationship between the developer and all potentially sensitive receptors. Communication channels should be established to ensure prior notice to the sensitive receptor if work is to take place close to them. Information that should be provided to the potential sensitive receptor(s) include:
  » Proposed working times.
  » How long the activity is anticipated to take place.
  » What is being done, or why the activity is taking place.
  » Contact details of a responsible person where any complaints can be lodged should there be an issue of concern.
» When working near (within 500 m – potential construction of access roads and trenches) to a potential sensitive receptor(s), limit the number of simultaneous activities to the minimum.
» When working near to potentially sensitive receptors, where possible coordinate the working time with periods when the receptors are not at home. An example would be to work within the 08h00 to 14h00 time-slot to minimise the significance of the impact because:
  » Potential receptors are most likely at school or at work, minimising the probability of an impact happening.
  » Normal daily activities will generate other noises that would most likely mask construction noises, minimising the probability of an impact happening.
» Technical solutions to reduce the noise impact during the construction phase include:
  » Using the smallest/quietest equipment for the particular purpose. For modelling purposes the noise emission characteristics of large earth-moving equipment (typically of mining operations) were used, that would most likely over-estimate the noise levels. The use of smaller equipment therefore would have a significantly lower noise impact.
» Ensuring that equipment is well-maintained and fitted with the correct and appropriate noise abatement measures.

Cumulative impacts:

This impact is cumulative with existing ambient background noises as well as other noisy activities conducted in the same area.

Residual impacts:

This impact will only disappear once construction activities cease.

Nature: Numerous turbines operating simultaneously during a period when a quiet environment is desirable

» Wind turbine noise can be associated with two types of noise source, namely aerodynamic sources due to the passage of air over the wind turbine blades and mechanical sources which are associated with components of the power train within the turbine, such as the gearbox and generator and control equipment.
» Transformer noise which is the "hum" frequently associated with substations. However, this is a relative easy noise to mitigate with the use of acoustic shielding and/or placement of the transformer equipment.
» Low frequency noise from a wind turbine (i.e. typically below 200 Hz) can usually not be detected except very near the source. However, there are people more sensitive for these low frequency sounds. The annoyance is often connected with the periodic nature of the emitted sounds rather than the frequency of the acoustic energy.

	Without mitigation	***With mitigation***
Extent	Local (2)	N/A
Duration	Permanent (5)	
Magnitude	Low – Medium (4)	
Probability	Possible (2)	
Significance	**Low (22)**	
Status (positive or negative)	Negative	
Reversibility	High	
Irreplaceable loss of resources	N/A	
Can impacts be mitigated	Yes, however it is not deemed necessary due to the low projected impact. A list of mitigation options is still presented that could further reduce the potential impact on the potentially sensitive receptors.	

Mitigation:

Should a complaint be received during the operational phases, mitigation measures that could reduce the risk of noise impacts include the following:

» Operating all, or selected wind turbines in a different mode. Most manufacturers allow their turbines to be operated in a different mode which allows the wind turbine generator to operate more silently with a slight reduction of electrical power generation capability.
» Problematic wind turbines could also be disabled, or the rotational speeds significantly decreased during periods when a quieter environment is desired (and complaints registered).

Furthermore, good public relations are essential at all stages of the project development and surrounding receptors should be educated with respect to the sound generated by wind turbines. The information presented to stakeholders should be factual and should not set unrealistic expectations.

Cumulative impacts:

This impact is cumulative with existing ambient background noises.

Residual impacts:

This impact will only disappear once the operation of the wind energy facility stops, or the sensitive receptor no longer exists.

Nomination of a preferred power evacuation option

There is no preference for a specific power evacuation option from a noise perspective.

Implications for project implementation

» The impact that the proposed facility could have on the surrounding environment (based on the current layout) is considered insignificant during the operational phase. It is recommended that the developer consider the various mitigation options proposed to further minimise noise impacts and risks.
» Should the layout (or type of wind turbines used) change significantly, it is recommended that the new layout be remodelled/reviewed in terms of the potential noise impact by an independent acoustics specialist.
» Quarterly monitoring noise monitoring at the potential sensitive receptors is recommended to be conducted by an approved noise inspection authority for the first year of operation. Quarterly monitoring is recommended at PSR11, PSR12, and PSR20 for the first year, as well as any other receptors that may have complained to the developer during the first year of operation regarding noise originating from the facility.

6.4.8 Assessment of Potential Social Impacts

Impacts on the social environment because of the wind turbines are expected to occur during both the construction and operation phases. During the construction phase the creation of employment and business opportunities is expected to have a moderate (positive) impact before the implementation of enhancement measures. The impact of heavy vehicles is expected to have a low significance prior to mitigation measures. The presence of construction workers on site and the resultant impacts on family structures is expected to have an impact of low – high significance (i.e. depending on whether the impact affects a community or individual respectively). The risk of stock theft, poaching activities, damage to farm infrastructure and potential loss of farm land will have a moderate significance rating as well the potential for veld fires (prior to the implementation of mitigation measures).

During the operational phase the creation of employment and business opportunities will have a positive impact of moderate significance prior to the implementation of enhancement measures. The promotion of renewable energy projects is expected to have a high positive impact. The impact on tourism may have both a positive and/or impact with a low significance and the visual impact (i.e. impact on the sense of place), will have a moderate negative impact.

Impacts associated with the transportation of components to the site

During the construction phase potential impacts associated with transportation and access relate to construction works within the site boundary (i.e. the wind energy facility and ancillary infrastructure) and external works outside the site boundary (i.e. road reconstruction/rehabilitation (e.g. R72), widening intersections, protection/accommodation of existing Eskom, Telkom and other municipal services, protection of existing road related structures etc.).

During construction, the access and internal service roads must be upgraded / constructed to support 15 ton axle loads to support the abnormal loads delivering the nacelles, crawler crane, and other components. It is assumed existing commercial quarries will be utilised and that material is available in the area. Should an appropriate source of material (or borrow pit) be required for borrow material, this would be required to be located and a mining permit obtained through the Department of Mineral Resources (DMR).

The crawler crane required for the erection of the wind turbines has a tracked width which will require a road of approximately 14 m wide when assembled. Within the wind energy facility development area, the crane laydown area, the operating platform and the service road area should be carefully planned and overlapped as much as practically possible in order to limit impacts on the surrounding area. The additional construction traffic to the site has the potential to lead to premature failure of access roads, both surfaced and gravel, between the source and the site. The gravel roads may need regular grading to smooth out the surface, but may need to be re-gravelled after completion of the project to restore it to its former condition.

Permits will be required to be obtained by Just Energy for transporting all components to site. These permits are at the discretion of the Permit Issuing Authorities. The issue of these permits is a major consideration before addressing the physical capability of the transport companies to deliver these components.

Impact table summarising the significance of social impacts during the construction phase (with and without mitigation/enhancement)

Nature: Creation of employment and business opportunities associated with the construction phase The construction phase is expected to extend over a period of 18-24 months and create approximately 30 temporary employment opportunities. The work associated with the construction phase will be undertaken by contractors and will include the establishment of the access roads and services and the erection of the wind turbines, substation(s), and power line(s).		
	Without enhancement	***With enhancement***
Extent	Local – Regional (2)	Local – Regional (4)

	(Rated as 2 due to potential opportunities for local communities and businesses)	(Rated as 4 due to potential opportunities for local communities and businesses)
Duration	Short term (2)	Short term (2)
Magnitude	Low (4)	Low (4)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Moderate (32)**	**Moderate (48)**
Status (positive or negative)	Positive	
Reversibility	N/A	
Irreplaceable loss of resources	N/A	
Can impacts be enhanced	Yes	

Enhancement:

» Where possible, Just Energy should make it a requirement for contractors to implement a 'locals first' policy for construction jobs, specifically semi- and low-skilled job categories. However, due to the low skills levels in the area, the majority of skilled posts are highly likely to be filled by people from outside the area or outside the country.
» Before the construction phase commences, Just Energy should meet with representatives from the Ngqushwa Municipality to establish the existence of a skills database for the area. If such as database exists it should be made available to the contractors appointed for the construction phase.
» The local authorities, community representatives, and organisations on the interested and affected party database should be informed of the final decision regarding the project and the potential job opportunities for locals and the employment procedures that Just Energy intends following for the construction phase of the project.
» Where feasible, training and skills development programmes for locals should be initiated prior to the initiation of the construction phase. The recruitment selection process should seek to promote gender equality and the employment of women wherever possible.

Business

» Just Energy should develop a database of local companies, specifically Black Economic Empowerment (BEE) companies that qualify as potential service providers (e.g. construction companies, catering companies, waste collection companies, security companies etc.) prior to the commencement of the tender process for construction contractors. These companies should be notified of the tender process and invited to bid for project-related work.
» Where possible, Just Energy should assist local BEE companies to complete and submit the required tender forms and associated information.
» The Ngqushwa Municipality in conjunction with the local Chamber of Commerce should identify strategies aimed at maximising the potential benefits associated with the project.

Cumulative impacts:

Opportunity to up-grade and improve skills levels in the area. However, due to relatively small number of local employment opportunities this benefit is likely to be limited.

Residual impacts:

Improved pool of skills and experience in the local area. However, due to relatively small number of local employment opportunities this benefit is likely to be limited.

Nature: Potential impacts on family structures and social networks associated with the presence of construction workers

While the presence of construction workers does not in itself constitute a social impact, the manner in which construction workers conduct themselves can affect the local community. In this regard the most significant negative impact is associated with the disruption of existing family structures and social networks. The potential risk to local family structures and social networks is, however, likely to be low. This finding is based on the relatively small number of construction workers associated with the construction phase, namely 30. In addition, the potential impact will be reduced by the stated objective of the employing people from the local community, specifically low skilled workers.

	Without mitigation	***With mitigation***
Extent	Local (2) (Rated as 2 due to potential severity of impact on local communities)	Local (1) (Rated as 1 due to potential severity of impact on local communities)
Duration	Short term for community as a whole (1) Long term-permanent for individuals who may be affected by STDs etc (5)	Short term for community as a whole (1) Long term-permanent for individuals who may be affected by STDs etc (5)
Magnitude	Low for the community as a whole (4) High-Very High for specific individuals who may be affected by STDs etc (10)	Low for community as a whole (4) High-Very High for specific individuals who may be affected by STDs etc (10)
Probability	Probable (3)	Probable (3)
Significance	**Low (21)** for the community as a whole **Moderate-High (51)** for specific individuals who may be affected by STDs etc	**Low (18)** for the community as a whole **Moderate-High (48)** for specific individuals who may be affected by STDs etc
Status (positive or negative)	Negative	
Reversibility	No in case of HIV and AIDS	
Irreplaceable loss of resources	Yes, if people contract HIV/AIDS. Human capital plays a critical role in communities that rely on farming for their livelihoods.	
Can impacts be mitigated	Yes, to some degree. However, the risk cannot be eliminated.	

Mitigation:

» Where possible, Just Energy should make it a requirement for contractors to implement a 'locals first' policy for construction jobs, specifically semi and low-skilled job categories.

» Just Energy should consider the establishment of a Monitoring Forum (MF) for the construction phase. The MF should be established before the construction phase commences and include key stakeholders, including representatives from the local community, local councillors, farmers, and the contractor. Its role would be to monitor the construction phase and the implementation of the recommended mitigation measures. The MF should also be

briefed on the potential risks to the local community associated with construction workers; » Just Energy and the contractor should, in consultation with representatives from the MF, develop a Code of Conduct for the construction phase. The Code should identify what types of behaviour and activities by construction workers are not permitted. Construction workers that breach the Code of Conduct should be dismissed. All dismissals must comply with the South African labour legislation. » Just Energy and the contractor should implement an HIV/AIDS awareness programme for all construction workers at the outset of the construction phase. » The movement of construction workers on and off the site should be closely managed and monitored by the contractors. In this regard the contractors should be responsible for making the necessary arrangements for transporting workers to and from site on a daily basis. » It is recommended that no construction workers, with the exception of security personnel, should be permitted to stay overnight on the site.
Cumulative impacts: Impacts on family and community relations that may, in some cases, persist for a long period. In cases where unplanned / unwanted pregnancies occur or members of the community are infected by an STD, specifically HIV and or AIDS, the impacts may be permanent and have long term to permanent cumulative impacts on the affected individuals and/or their families and the community.
Residual impacts: See cumulative impacts.

Nature: Potential loss of livestock, poaching and damage to farm infrastructure		
	Without mitigation	***With mitigation***
Extent	Local (4) (Rated as 4 due to potential severity of impact on local farmers)	Local (2)
Duration	Short term (2)	Short term (2)
Magnitude	Moderate (6) (Due to reliance on agriculture and livestock for maintaining livelihoods)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Moderate (36)**	**Low (24)**
Status (positive or negative)	Negative	
Reversibility	Yes, compensation paid for proven stock losses etc	
Irreplaceable loss of resources	No	
Can impacts be mitigated	Yes	
Mitigation: » Just Energy should consider the establishment of a MF (see above) that includes local farmers and communities and develop a Code of Conduct for construction workers. This		

committee should be established prior to commencement of the construction phase. The Code of Conduct should be signed by Just Energy and the contractors before the contractors move onto site.

» Just Energy should hold contractors liable for compensating farmers and communities in full for any proven stock losses and/or damage to farm infrastructure that can be linked to construction workers. This should be contained in the Code of Conduct to be signed between Just Energy, the contractors and neighbouring landowners. The agreement should also cover loses and costs associated with fires caused by construction workers or construction related activities (see below).
» The EMP should contain procedures for managing and storing waste on site, specifically plastic waste that poses a threat to livestock if ingested.
» Contractors appointed by Just Energy must ensure that all workers are informed at the outset of the construction phase of the conditions contained on the Code of Conduct, specifically consequences of stock theft and trespassing on adjacent farms.
» Contractors appointed by Just Energy must ensure that construction workers who are found guilty of stealing livestock, poaching and/or damaging farm infrastructure are dismissed and charged. This should be contained in the Code of Conduct. All dismissals must be in accordance with South African labour legislation.
» The housing of construction workers on the site should be limited to security personnel.

Cumulative impacts:
No, provided proven losses are compensated for.

Residual impacts:
See cumulative impacts.

Nature: Assessment of impact as a result of construction vehicles
Road access to the proposed study site is via the R72 which links East London and Port Alfred. The delivery of this equipment could equate to up to 20 truck loads and 2 - 3 abnormal loads but will be a once-off trip for each of the crane components where after the crane will remain on site for the duration of the construction phase.

The movement of heavy construction vehicles on the site itself may damage internal un-surfaced roads; however, the current road use frequency is low. In addition, the internal access roads will need to be up-graded in order to facilitate access to the site.

	Without mitigation	***With mitigation***
Extent	Local (2)	Local (2)
Duration	Short term (2)	Short term (2)
Magnitude	Low (4)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	**Low (24)**	**Low (18)**
Status (positive or negative)	Negative	
Reversibility	Yes	
Irreplaceable loss of resources	No	
Can impacts be mitigated	Yes	

Mitigation:

» Dust suppression measures must be implemented for heavy vehicles such as wetting of gravel roads on a regular basis and ensuring that vehicles used to transport sand and building materials are fitted with tarpaulins or covers.
» All vehicles must be road-worthy and drivers must be qualified, made aware of the potential road safety issues, and need for strict speed limits.

Cumulative impacts:

If damage to roads is not repaired then this will impact on the farming activities in the area and result in higher maintenance costs for vehicles of local farmers and other road users. The costs will be borne by road users who were not responsible for the damage.

Residual impacts:

See cumulative impacts.

Nature: Assessment of impact on farmland due to construction related activities

The activities associated with the construction phase may damage farmlands and result in a loss of farmlands for future farming activities. The significance of these impacts is mitigated by the fact that the farming activities in the area are confined to stock farming as opposed to crops. In addition the number of wind turbines is low (22) and the development footprint will be limited.

	Without mitigation	***With mitigation***
Extent	Local (2)	Local (1)
Duration	Long term-permanent if disturbed areas are not rehabilitated (5)	Short term if damaged areas are rehabilitated (1)
Magnitude	Moderate, due to importance of farming in terms of local livelihoods (4)	Minor (2)
Probability	Definite (5)	Highly Probable (4)
Significance	**Moderate (55)**	**Low (16)**
Status (positive or negative)	Negative	
Reversibility	No, in case of footprint associated with the facility.	
Irreplaceable loss of resources	Yes, loss of farmland. However, disturbed areas can be rehabilitated.	
Can impacts be mitigated	Yes, however, loss of farmland cannot be avoided.	

Mitigation:

» The footprint associated with the construction related activities (access roads, turning circles, construction platforms, workshop, etc) should be minimised.
» An Environmental Control Officer (ECO) should be appointed to monitor the establishment phase of the construction phase.
» All areas disturbed by construction related activities, such as access roads, construction platforms, workshop area etc, should be rehabilitated at the end of the construction phase;
» The implementation of a rehabilitation programme should be included in the terms of reference for the contractor/s appointed to establish the proposed facility. The specifications for the rehabilitation programme should be drawn up the botanical specialist appointed as part of the EIA process.

» The implementation of the Rehabilitation Programme should be monitored by the ECO. » Just Energy should compensate farmers that suffer a permanent loss of land due to the establishment of the facility. Compensation should be based on accepted land values for the area. The findings of the social impact assessment indicate that the farmers affected by the proposed facility are being compensated for the loss of land. In addition they are being compensated for participating in the project.
Cumulative impacts: Overall loss of farmland could affect the livelihoods of the affected farmers, their families, and the workers on the farms and their families. However, disturbed areas can be rehabilitated.
Residual impacts: See cumulative impacts.

Impact table summarising the significance of social impacts during the operational phase (with and without mitigation)

Nature: Creation of employment and business opportunities associated with the operational phase The number of employment opportunities associated with the operational phase is limited due to the types of positions available and the skills availability.		
	Without mitigation	***With mitigation***
Extent	Local and Regional (2)	Local and Regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Moderate (6)
Probability	Probable (3)	Highly Probable (4)
Significance	**Moderate (30)**	**Moderate (52)**
Status (positive or negative)	Positive	
Reversibility	N/A	
Irreplaceable loss of resources	No	
Can impacts be enhanced	Yes	
Enhancement: Just Energy should implement a training and skills development programme for locals during the operational phase, where feasible. The aim of the programme would be to maximise the number of South African's and locals employed during the operational phase.		
Cumulative impacts: Creation of permanent employment and skills and development opportunities for members from the local community and creation of additional business and economic opportunities in the area		
Residual impacts: See cumulative impacts.		

Nature: Development of infrastructure to generate clean, renewable energy

The overall contribution to South Africa's total energy requirements of the proposed wind energy facility is relatively small. However, the energy produced will offset the total carbon emissions associated with energy generation in South Africa. Given South Africa's reliance on Eskom as a power utility, the benefits associated with an IPP based on renewable energy are regarded as significant.

	Without mitigation	***With mitigation***
Extent	Local, Regional and National (3)	Local, Regional and National (3)
Duration	Long term (4)	Long term (4)
Magnitude	High (8)	High (8)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	**High (60)**	**High (60)**
Status (positive or negative)	Positive	
Reversibility	Yes	
Irreplaceable loss of resources	Yes, impact of climate change on ecosystems	
Can impacts be enhanced	Yes	

Enhancement:

» Use the project to promote and increase the contribution of renewable energy to the national energy supply.
» Maximise the public's exposure to the project via an extensive communication and advertising programme.
» Implement a training and skills development programme for locals during the first 5 years of the operational phase. The aim of the programme should be to maximise the number of South African's employed during the operational phase of the project.

***Cumulative impacts*:**

Reduce carbon emissions via the use of renewable energy and associated benefits in terms of global warming and climate change.

***Residual impacts*:**

See cumulative impacts.

Nature: Potential impact of the wind energy facility on local tourism

The proposed facility has the potential to impact negatively on the experience of tourists travelling through and visiting the area. However, visual impacts are subjective and differ from person to person, so while some may find the presence of wind turbines to negative, others may be indifferent of may even find that they add to their experience of the area. The impact on tourism therefore has the potential to be both negative and positive.

	Without mitigation	***With mitigation***
Extent	Local (2)	Local (3)
Duration	Long term (4)	Long term (4)
Magnitude	Low (2)	Low (2)
Probability	Probable (3)	Probable (3)

Significance	**Low (24)** (both negative and positive)	**Low (27)** (both negative and positive)
Status (positive or negative)	Positive / negative	
Reversibility	Yes	
Irreplaceable loss of resources	No	
Can impacts be enhanced	Yes	
Mitigation: » Just Energy should liaise with representatives from the Ngqushwa Municipality and local tourism representatives to raise awareness of the proposed wind energy facility. » Just Energy should establish a renewable energy interpretation centre at the site. The centre should include covered viewing area where passing visitors can stop and view the site. The viewing site should be equipped with information boards that provide visitors with information on the project and other relevant information. » In order to maximise the benefits of the information board to the broader community it is recommended that the information be presented in the two main languages of the Eastern Cape, namely English and Xhosa.		
Cumulative impacts: Potential benefit for tourism in the Ngqushwa Municipal Area.		
Residual impacts: See cumulative impacts.		

Nature: Impact of the no-development option This would result in the lost opportunity for South Africa to supplement is current energy needs with clean, renewable energy.		
	Without mitigation	***With mitigation***
Extent	Local-International (5)	Local-International (5)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Moderate (6)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	**High (60)**	**High (60)**
Status (positive or negative)	Negative	Positive
Reversibility	Yes	
Irreplaceable loss of resources	Yes, impact of climate change on ecosystems	
Can impacts be enhanced	Yes	
Mitigation: The proposed facility should be developed and the mitigation and enhancement measures should be implemented. However, as indicated above there are concerns regarding the impact of the facility on the sense of place and the area's landscape character. These issues need to be addressed in the design and layout of the proposed facility.		

Cumulative impacts: Reduce carbon emissions via the use of renewable energy and associated benefits in terms of global warming and climate change.
Residual impacts: See cumulative impacts.

The significance of social impacts during the Decommissioning Phase (with and without mitigation)

During the decommissioning phase the impacts are likely to be limited due to the small number of permanent employees (10) affected. The potential impacts associated with the decommissioning phase can also be effectively managed with the implementation of a retrenchment and downscaling programme. With mitigation, the impacts are assessed to be Low (negative).

Comparative assessment of layout options

The findings of the social impact assessment indicate that there are no significant social impacts associated with any of the substations and or the associated transmission line routes. In this regard the potential visual or sense of place issues associated with the proposed substations and transmission line alignments will not exacerbate the impacts associated with the wind turbines themselves. The location of the proposed substations and transmission lines are therefore regarded as acceptable from a social perspective. However, based on the findings of the visual impact assessment, Option 2 is the preferred option.

Implications for project implementation

» The significance of the potential health risks posed by the proposed facility is of low significance.
» The proposed development represents an investment in clean, renewable energy infrastructure, which, given the challenges created by climate change, represents a positive social benefit for society as a whole.
» The development will create employment and business opportunities for locals during both the construction and operational phase of the project.
» None of the landowners or stakeholders who stand to be directly affected by the proposed wind energy facility are opposed to the development.

6.5 Summary of All Impacts

As a summary of the potential impacts identified and assessed through the EIA process, the following provide a diagrammatic representation of the significance ratings for the potential biophysical and social impacts.

As indicated in Chapter 3, the significance weightings for potential impact have been rated as follows:

» **< 30 points:** Low (i.e. where this impact would not have a direct influence on the decision to develop in the area)
» **30-60 points:** Moderate (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated)
» **> 60 points:** High (i.e. where the impact must have an influence on the decision process to develop in the area).

As a summary of the potential impacts identified and assessed through the EIA process, the following table provides a summary of the impact rating.

Nature	Without mitigation	With mitigation
Potential impacts on vegetation and ecology		
Impact on bat species	Low - Moderate	Low - Moderate
Impact on threatened species due to habitat loss	Low	Low
Loss of individuals protected tree species	Low	Low
Loss of indigenous natural vegetation	Low - High	Low - Medium
Damage to wetlands	Low - High	Low - Medium
Establishment and spread of declared weeds and alien invader plants	Moderate	Moderate
Potential impacts on avifauna		
Disturbance during the construction and operational phases	Moderate	Moderate
Habitat loss - destruction of habitat for priority species, either temporary – resulting construction activities peripheral to the built area, or permanent - the area occupied by the completed development	Moderate	Moderate
Mortality - Collision of priority species with the wind turbine blades and/or any new power lines, or electrocution	Moderate	Low - Moderate
Potential impacts on geology, soil, and erosion potential		
Soil degradation - excavation and removal of soil for roads and structures, affecting soil	Moderate	Moderate

formation processes, hydrology, and ecosystems		
Soil degradation - loosening, mixing, wetting, and compacting of in situ soil during earthworks, affecting soil formation processes, hydrology, and ecosystems	Moderate	Moderate
Soil degradation - soil erosion by wind and water, affecting soil forming processes, agricultural potential, hydrology, and ecosystems	Moderate	Low
Soil degradation - pollution of soil by contaminants used in construction (e.g. fuel, oil, cement), affecting soil forming processes and ecosystems	Low	Low
Siltation of waterways and dams downstream from site, affecting ecosystems and hydrology	Moderate	Low
Dust pollution from construction site affecting areas surrounding site	Moderate	Low
Potential impacts on heritage sites		
Loss of stone artefact scatters and possible sites during the construction phase	Moderate	N/A
Potential impacts on palaeontology		
Disturbance or destruction of valuable fossil heritage within the potentially fossiliferous lower Beaufort Group sediments	Moderate	Low
Potential visual impacts		
On users of major roads (the R72) and secondary roads in close proximity to the proposed facility	High	N/A
On residents of built up centres in close proximity to the proposed facility	Moderate	N/A
On residents of settlements and homesteads in close proximity to the proposed facility	High	N/A
On sensitive visual receptors (users of roads and residents of towns, settlements and homesteads) within the region	Moderate	N/A
On heritage and tourism initiatives in close proximity to the proposed facility	Moderate	N/A
On heritage and tourism initiatives within the region	Low	N/A
On conservation areas within the region	Low	
Potential visual impact of the substation(s) and ancillary building(s)	Low	N/A

Potential visual impact of the power lines	Moderate	N/A
Potential visual impact of the internal access roads	Moderate	Low
Potential visual impact of lighting on visual receptors in close proximity of the proposed facility	Moderate	Low
Potential visual impact of construction on visual receptors in close proximity of the proposed facility	Moderate	Low
Potential noise impacts		
Numerous simultaneous construction activities that could affect potential sensitive receptors.	Moderate	N/A
Numerous turbines operating simultaneously during a period when a quiet environment is desirable.	Low	N/A
Potential social impacts		
Creation of employment and business opportunities associated with the construction phase	Moderate	Moderate
Potential impacts on family structures and social networks associated with the presence of construction workers	Low - High	Low - High
Potential loss of livestock, poaching and damage to farm infrastructure	Moderate	Low
Assessment of impact as a result of construction vehicles	Low	Low
Assessment of impact on farmland due to construction related activities	Moderate	Low
Creation of employment and business opportunities associated with the operational phase	Moderate	Moderate
Development of infrastructure to generate clean, renewable energy	High	High
Visual impact associated with the proposed wind turbines and the potential impact on the areas rural sense of place	Moderate	Moderate
Potential impact of the wind energy facility on local tourism	Low	Low
The no-development option would result in the lost opportunity for South Africa to supplement is current energy needs with clean, renewable energy	High	High

6.6 Comparative Assessment of Layout Options

The findings of the specialist studies regarding preference of the power line and substation options is summarised in the table below.

Specialist area	Option preference
Ecology	**Options 3 and 4** – these options 3 and 4 appear to have the least impact on the natural environment, primarily because the power line routes are aligned with existing linear infrastructure, and the substation positions are positioned within transformed or degraded habitat and affect little natural habitat. **Options 1 and 2** would be similarly suitable if substations 1 or 2 are shifted to the north-west to avoid the area of natural habitat that is of concern (i.e. apply the recommended mitigation measures). This would mean that the substations and power lines for options 1 and 2 would not be required to infringe on this area of natural vegetation and the impacts on vegetation would therefore be the same as for options 3 and 4.
Avifauna	**Option 2** - Options 1 and 2 would require a single power line to service both phases, whereas options 3 and 4 would require two. Therefore option 2 is preferred as this configuration requires the shortest length of new power line therefore minimising the potential collision risk.
Geology & erosion potential	**Option 1** - is preferred overall as the proposed power line would largely follow the existing access road and is preferred as it is deemed to have a lower impact on undisturbed ground. This option carries a low significance in terms of the potential impacts on the geological environment.
Heritage & archaeology	No preference.
Palaeontology	No preference.
Visual	**Option 2** – this option entails only one power line to a single substation serving both phases 1 and 2 of the proposed facility. Option 2 is favoured from a visual perspective as this is a 22 kV connection with a smaller power line tower required.
Noise	No preference.
Social	**Option 2** – there is no distinct preference, however, option 2 is deemed preferable based on the outcomes of the visual assessment.

All four options meet the acceptance level for environmental impacts, and will ensure that impacts are minimised to an acceptable level which can be managed through the implementation of an Environmental Management Plan. The preferred option for the substation location and power line is **Option 2**, based on the recommendations of the specialist investigations. The key motivation for this preference is one substation and one power line, reducing the physical footprint required for development, and reducing the length of power line (reduced potential for avifauna collisions and for visual impact).

6.7 Assessment of Potential Cumulative Impacts

A cumulative impact, in relation to an activity, refers to 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 undertaking in the area[17].

» Cumulative ***ecological impacts*** - impacts that cause loss of habitat (e.g. soil erosion, alien invasions, damage to wetlands) may exacerbate the impact of the proposed facility impact. Such as example is the region's land-use practice (i.e. communal land used as rangeland for subsistence livestock production).

» Cumulative ***avifauna impacts*** – impacts related to disturbance, habitat loss and collision related mortality may become cumulative if other wind energy facilities are developed in the region. However, neither facilities of this nature nor any additional power line infrastructure is currently proposed in the area, therefore the potential for cumulative impacts are low. Collision rates may appear relatively low in many instances, however cumulative effects over time, especially when applied to large, long lived, slow reproducing and/or threatened species (many of which are collision-prone), may be of considerable conservation significance. Furthermore, when viewed in isolation, one wind energy facility may pose only a limited threat to the avifauna of the region. However, in combination they may result in the formation of significant barriers to energy-efficient travel between resource areas for regionally important bird populations, and/or significant levels of mortality in these populations in collisions with what may become repeated arrays of turbines spread across foraging areas and/or flight paths of priority species.

» Cumulative ***geology, soil and erosion potential impacts*** - although the impact of soil removal for the proposed activity has a moderate significance, the cumulative impact of soil removal in the area is considered low due to undeveloped nature of the area. The cumulative impact of soil pollution in the area is considered moderate due to the severely degraded by mining operations to the south of the study area. The cumulative impact of siltation and dust in the area is considered low.

» Cumulative ***noise impacts*** - the impact of numerous simultaneous construction activities that could affect potential sensitive receptors is cumulative with existing ambient background noises as well as other noisy activities conducted in the same area. Due to the rural nature of the area, the potential for cumulative impacts is low.

» Cumulative ***visual impacts*** - The construction of 22 wind turbines together with the substation/s and other associated infrastructure may increase the cumulative visual impact of electricity related infrastructure within the region. However, the existing

[17] Definition as provided by DEA in the EIA Regulations.

infrastructure in the immediate areas is of a smaller scale, and therefore cumulative impacts are not considered likely. The siting and number of individual turbines determines the potential for cumulative visual impacts on farmsteads and key roads in the area.

» Cumulative ***social impacts*** - Due to the rural nature of the area, and the limited opportunities/exposure to development of the local communities, the potential for cumulative impacts is low. The overall cumulative impact on the rural character and the area's sense of place is considered low.

Cumulative impacts have been considered in further detail within the specialist studies (refer to Appendices E – L). No other wind energy facilities have been authorised in the study area. This in conjunction with the rural nature of the area means there is a low potential for cumulative negative impacts.

CONCLUSIONS AND RECOMMENDATIONS CHAPTER 7

Just Energy in association with the Uncedo Lwethu Farmers Cooperative proposes the establishment of a community based wind energy facility on a site in the Eastern Cape Province. It is proposed for a cluster of up to **22 wind turbines** (collectively described as a wind energy facility) to be constructed over an area of approximately 20 km^2 in extent.

The construction and commissioning of the facility is proposed to be implemented in **two** phases, with the first commissioned phase of the project planned to comprise up to 10 turbines (i.e. approximately ten 3 MW industry standard turbines which would generate in the order of 30 MW). The second phase would comprise the remaining 12 turbines, with the total facility not exceeding 22 turbines (i.e. a maximum generating capacity of 66 MW with both phases).

The three primary components of the project (i.e. areas of activity) include the following:

» A **wind energy facility** including up to 22 wind turbine generator units, one or two substations, underground electrical cabling between the turbines and the substation(s), internal access roads, and ancillary buildings and infrastructure including control rooms and workshop areas.
» Overhead distribution **power line(s)** from the facility substation feeding into the electricity network/grid at Eskom's existing Wesley Substation location approximately 5 km west of the site.

An area of approximately 20 km^2 in extent falling within the Ngqushwa Local Municipality in the Eastern Cape Province was identified by Just Energy in conjunction with the Uncedo Lwethu Farmers Cooperative as being potentially suitable for a wind energy development. This site was originally proposed, not only from a technical perspective, but for benefitting the local community through the generation of rental income for the properties on which the facility will be located. Furthermore, an equity share in the facility will be granted to the local community during the operational phase. The identified area falls on the following farm portions:

» *Riverbank 147* - three informal subdivisions and the title deeds were last registered in 1925.
» *Sandflat 149* - eight formal subdivisions of which only one has a legally secured registration; the other seven were last registered in the 1950s.
» *Holstein 148* - four subdivisions of which only one has a legal registration; the other three are still registered to the former Republic of Ciskei.
» *Porcupine Kop 169* - no subdivision and is registered to the former Republic of Ciskei.
» *Bristol 170* - no subdivision and is registered to the former Republic of Ciskei.

Just Energy is in the process of assisting the land owners finalise the estates and develop Family Trusts for Riverbank 147 and Sandflat 149. Just Energy together with the Uncedo Lwethu Cooperative is in the process of obtaining a 25 year lease from the Government over Holstein 148, Porcupine Kop 169, and Bristol 170. This lease application will be made by the Uncedo Lwethu Farmers Cooperative to the Department of Rural Development and Land Reform to grant a short term (5 years) lease followed by a long term (25 years) lease.

7.1 Environmental Impact Assessment for the Proposed Project

The EIA for the proposed wind energy facility has been undertaken in accordance with the EIA Regulations published in Government Notice 28753 of 21 April 2006, in terms of Section 24(5) of the National Environmental Management Act (NEMA; Act No 107 of 1998)[18].

The EIA Phase aimed to achieve the following:

» Provide an overall assessment of the social and biophysical environments affected by the proposed project.
» Assess potentially significant impacts (direct, indirect, and cumulative, where required) associated with the proposed wind energy facility and its associated infrastructure.
» Comparatively assess identified technically feasible alternatives put forward as part of the project.
» Nominate a preferred power evacuation option (i.e. substation(s) site and associated power line(s) route), for consideration by the decision-making authorities.
» Identify and recommend appropriate mitigation measures for potentially significant environmental impacts.
» Undertake a fully inclusive public involvement process to ensure that I&APs are afforded the opportunity to participate, and that their issues and concerns are recorded.

The conclusions and recommendations of this EIA Report are the result of the assessment of identified impacts by specialists, and the parallel process of public participation. The public involvement process has been extensive and every effort has been made to include representatives of all the relevant communities and stakeholders in the study area. Regarding the level of public participation required for the EIA phase the nature of the potentially affected parties was taken into consideration. The communities that may be affected are predominantly of a rural nature, many of whom are not literate or do not speak English. Therefore the approach to the public

[18] Note that these EIA Regulations were current at the time of submitting the Application for Authorisation and therefore this process has been completed in terms of these Regulations.

participation has been to introduce the project to the community in a simplified manner while remaining transparent and accurate in the delivering of project specific information.

7.2 Evaluation of the Proposed Project

The preceding chapters of this report together with the specialist studies contained within Appendices E - L provide a detailed assessment of the environmental impacts on the social and biophysical environment of the proposed project. This chapter concludes the EIA process by providing a holistic evaluation of the most significant environmental impacts identified through the process. In so doing, it draws on the information gathered as part of the EIA process and the knowledge gained by the environmental consultants during the course of the EIA and presents an informed opinion of the proposed project.

The most significant environmental impacts associated with the proposed project, as identified through the EIA, include:

» Visual impacts on the natural scenic resources of the study area and/or region imposed by the components of the facility (i.e. particularly through the visual exposure of the prominent wind turbine structures).
» Local site-specific impacts as a result of physical disturbance/modification to the site with the establishment of the facility and associated power line infrastructure.
» Impacts on the social environment (i.e. these will manifest as both positive and negative impacts).

7.2.1 Visual Impacts associated with the Wind Energy Facility

The most significant impact associated with the proposed facility is the visual impact on the natural scenic resources of this study area and/or region imposed by the components of the facility for the operational lifespan (approximately 25 years).

The proposed facility would have a relatively large area of potential visual exposure due to the height of the wind turbines and their relatively elevated position within the landscape. The highest frequency of exposure is expected in the immediate vicinity (i.e. within 3 km) of the proposed facility, with lower frequencies along the river valleys. Further from the facility, the areas of visual exposure become more fragmented, especially to the north and west, where the increasingly hilly topography offers partial visual screening. The frequency of exposure remains generally moderate to high.

Viewer incidence is calculated as the highest along the arterial roads (i.e. the R72 and to a lesser degree the R345) as well as the secondary roads within the study area (i.e. especially the gravel roads to Hamburg). Other than along the abovementioned roads,

viewer incidence within a 10 km radius of the proposed facility is concentrated in a number of small towns, while the remaining areas consist predominantly of agricultural land interspersed with vacant natural land and rural dwellings with a low occurrence of observers (i.e. homesteads and settlements). Tourists to the area are seen as potentially sensitive visual receptors upon which the construction of the facility could have a negative visual impact. The severity of the visual impact on these receptors decreases with increased distance from the proposed facility (refer to Figure 7.1):

» The potential visual impact on users of major / secondary roads in close proximity to the proposed facility as well as on settlements and homesteads will be of high significance.
» The potential visual impact on heritage / tourism potential in close proximity to the proposed facility, as well as on residents of nearby towns will be of moderate significance.
» Within the broader region, the potential visual impact on heritage and tourism potential, initiatives (i.e. destinations, facilities and routes) and on conservation areas (i.e. the Hamburg Nature Reserve) will be of low significance.
» Various ancillary infrastructure is expected to result in visual impacts of moderate (power lines) and low (substations and ancillary buildings) significance.

Figure 7.1 illustrates the post-construction view from the R72 at the junction of the secondary road to Hamburg. This position is set a medium distance from (5 km) the closest turbines and is indicative of what will be seen from the north of the proposed wind energy facility while travelling on the R72 and secondary road. The viewing direction is south-easterly, and roughly 21 turbines may be fully to partially visible in the landscape. This view is representative of a short to medium distance visual experience that travellers moving between Wesley and East London, as well as those travelling towards Hamburg, will have of the proposed turbines.

Figure 7.1: Post-construction panoramic overview from the R72

The anticipated visual impacts listed above are not, however, considered a fatal flaw from a visual perspective, considering the contained area of potential visual exposure. The anticipated visual impact is not likely to detract from the regional tourism appeal, numbers of tourists or tourism potential of the area. This is specifically relevant for the tourist and heritage routes, as tourists travelling along these routes will be exposed to

the proposed facility for only a very short period of their journey. In addition, the tourist destinations in the area (i.e. the beaches, the rivers and the Sandcastle Villa) are expected to orientate away from the facility (i.e. toward the ocean and / or the rivers). In this respect, tourists will only be visually exposed to the facility for a short period while en route to these destinations, and not from the destinations themselves.

The primary visual impact, namely the appearance and dimensions of the wind energy facility (mainly the wind turbines) is not possible to mitigate to any significant extent within this landscape. The functional design of the structures and the dimensions of the facility cannot be changed in order to reduce visual impacts. Alternative colour schemes (i.e. painting the turbines sky-blue, grey, or darker shades of white) are not permissible as the CAA's Marking of Obstacles expressly states, "*Wind turbines shall be painted bright white to provide the maximum daytime conspicuousness*." Failure to adhere to the prescribed colour specifications will result in the fitting of supplementary daytime lighting to the wind turbines, once again aggravating the visual impact. The potential for mitigation is therefore low or non-existent.

The mitigation of secondary visual impacts, such as security and functional lighting, construction activities, etc. may be possible and should be implemented and maintained on an on-going basis.

7.2.2 Local Site-Specific Impacts

A wind energy facility is dissimilar to other power generation facilities in that it does not result in whole-scale disturbance to a site. From the results of the facility layout determination exercise, it is now apparent that the effective area required to accommodate the infrastructure is in fact approximately 0.12 km^2 in extent (this amounts to approximately 0.7% of the total 20 km^2 site earmarked for development). The bulk of this effective area required for the facility footprint would not suffer any level of disturbance as a result of the required activities on site.

Permanently affected areas comprise 22 turbine footprints (22 foundation areas of 20 m x 20 m in extent), access roads (5 m – 6 m wide with a 25 m turning radii), substation footprint (worst case scenario of 120 m x 70 m in extent for option 1), and a single storey building for the establishment of ancillary infrastructure (~350 m^2).

The area of permanent disturbance is therefore as follows:

Facility component - permanent	Approximate area/extent (in m^2)
22 turbine footprints (each 20 m x 20 m)	8 800
Permanent internal access roads (22 km x 6 m)	132 000
Substation footprint (120 m x 70 m)	8 400
Ancillary infrastructure	350
TOTAL	**149 550** (of a total area of 20 000 000) = 0.7% of site

Temporarily affected areas comprise laydown areas for turbines (each laydown area with a footprint of 150 m x 20 m as a worst case scenario) as well as a track of an additional 8 m in width for the crawler crane to move across the site (i.e. an additional 8 m width to the permanent road of 6 m in width). The 33 kV cabling to connect the turbines to the substation is to make use of the disturbed area travelled over by the crane. An approximately 1 m wide trench would be excavated, the cabling laid and the area rehabilitated. The area of temporary disturbance is as follows:

Facility component - temporary	Approximate area/extent (in m^2)
22 turbine laydown areas (150 m x 20)	66 000
Temporary crane travel (14 m) (including a cable trench (1 m))	308 000
Construction site compound	7 500
Power line corridor (2 km on-site x 8 m servitude required to be cleared)	16 000
TOTAL	397 500 (of a total area of 20 000 000) = ~1.6% of site

Therefore, an area of approximately 0.4 km^2 can be anticipated to be disturbed to some extent during the construction of the wind energy facility. This amounts to **less than 2%** of the total area which will form part of the total facility.

No-Go Areas

The only areas which can be considered as a 'no go' areas for the construction of infrastructure (including turbines) is the natural drainage lines/watercourses including the 32 m buffer from the edge of the riparian zone. These areas are regarded as being highly sensitive as these wetland areas form biological corridors, lie upstream of sensitive estuaries, and severe erosion is presently taking place along some of the southern drainage lines (refer to Figure 7.2). The proposed site is located within an area of moderate to high susceptibility to erosion, with the cohesionless silty sands being prone to erosion if exposed to the elements, especially on slopes with gradients

exceeding 1:4. Furthermore, physical alteration to natural drainage lines/watercourses can have an impact on their functioning, consequences of which may include:

» Increased loss of soil;
» Loss of or disturbance to indigenous wetland vegetation;
» Loss of sensitive wetland habitats;
» Loss or disturbance to individuals of rare, endangered, endemic and/or protected species that occur in wetlands;
» Fragmentation of sensitive habitats;
» Impairment of wetland function; and
» Change in channel morphology in downstream wetlands, potentially leading to further loss of wetland vegetation.

Any planned disturbance to these drainage lines/watercourses will require a permit from the Department of Water Affairs.

Figure 7.2: Erosion along the Ngculura River in southern portion of Sandflat 149

Areas of High – Moderate Sensitivity

The study area falls within the Albany Coastal Belt (i.e. classified as Least Threatened) which falls into the Albany Thicket Biome. A large proportion of the study areas is natural (35%), although parts are degraded to varying degrees through land-use

practices. Despite low levels of transformation, rates of degradation may be relatively high in these areas due to subsistence livestock production. From an ecological perspective, a potentially sensitive area includes the hill proposed for substation Options 1 and 2. This area is located within natural habitat with relatively unique species composition and diversity in comparison to the rest of the site. It is probably also the piece of vegetation on site in the best condition. Several other features of concern in terms of ecological sensitivity include (refer to Figure 7.3):

» *Perennial and non-perennial rivers and streams* - these areas represent a number of ecological processes including groundwater dynamics, hydrological processes, nutrient cycling and wildlife dispersal
» *Potential occurrence of populations of Red List organisms* - including flora and fauna that have been evaluated as having a high chance of occurring within remaining natural habitats within the study area
» *Estuaries and estuarine habitats* - that occur off-site, but which may be affected by activities on site.

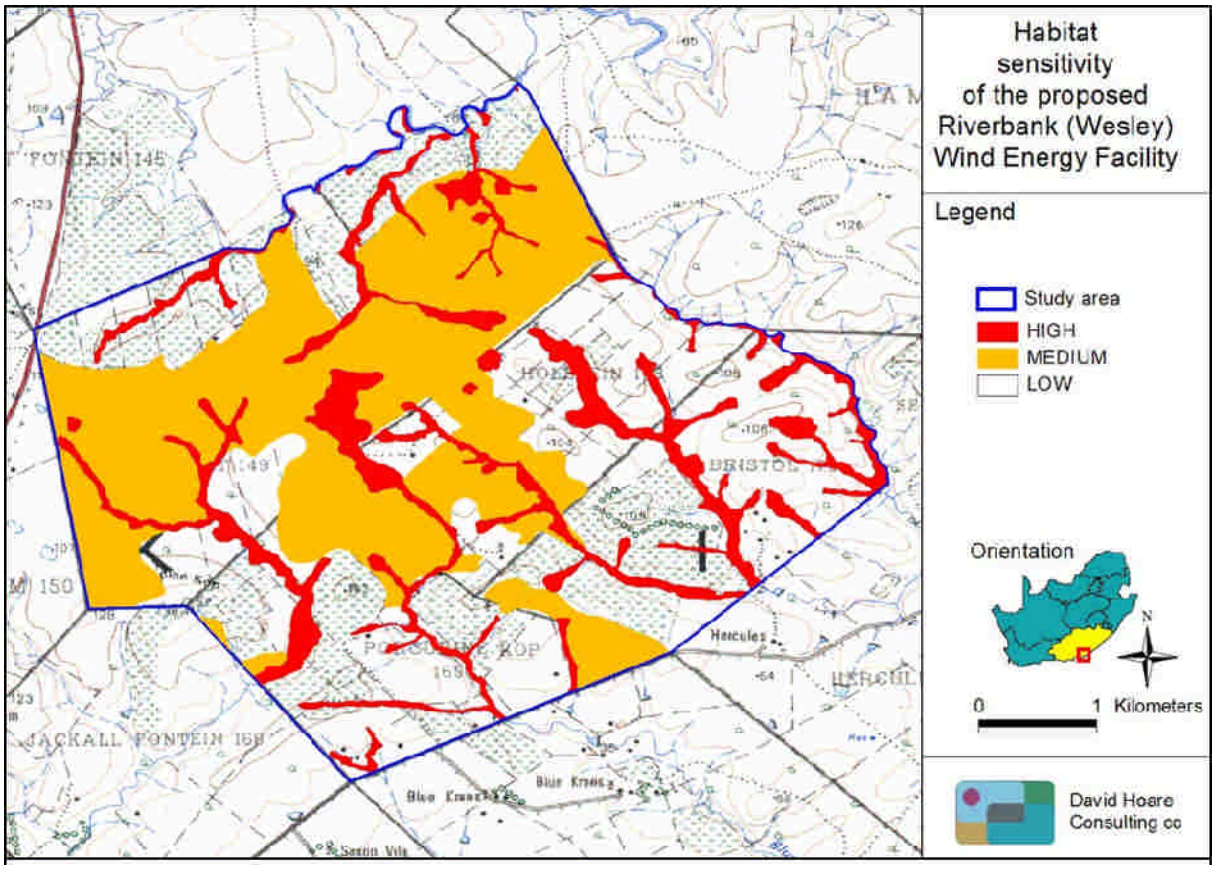


Figure 7.3: Map illustrating the ecological sensitivity within different parts of the study site

From a heritage perspective the modern grave and possible informal burials which are protected by legislation and must be avoided to prevent any damage to these features. Furthermore the possible Historical/Late Iron Age settlement and immediate surrounding

area must be identified and cordoned off prior to development to avoid negative impact from the tracks to be used (refer to Figure 7.4).

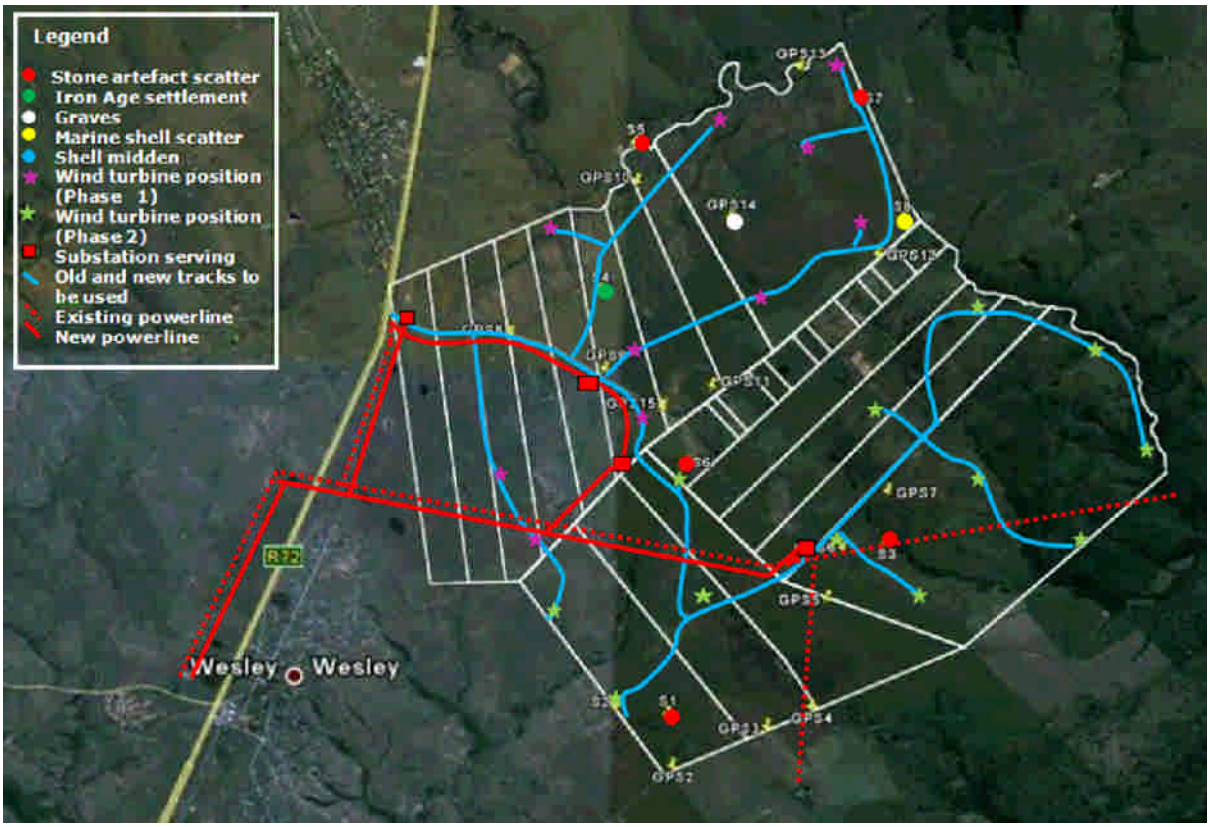


Figure 7.4: Aerial close-up showing heritage site locations, wind turbine positions and associated infrastructure

From a noise impact perspective, potential noise-sensitive receptors where identified both in and around the development site (refer to Figure 7.5). The proposed project will have an impact of medium significance on specific receptors in the area during the construction phase, and a low significance during the operational phase. Mitigation measures are proposed to allow a further potential to reduce noise impacts as well as noise risks. Quarterly monitoring is recommended at PSR11, PSR12, and PSR20 for the first year, as well as any other receptors that have complained to the developer regarding noise originating from the facility.

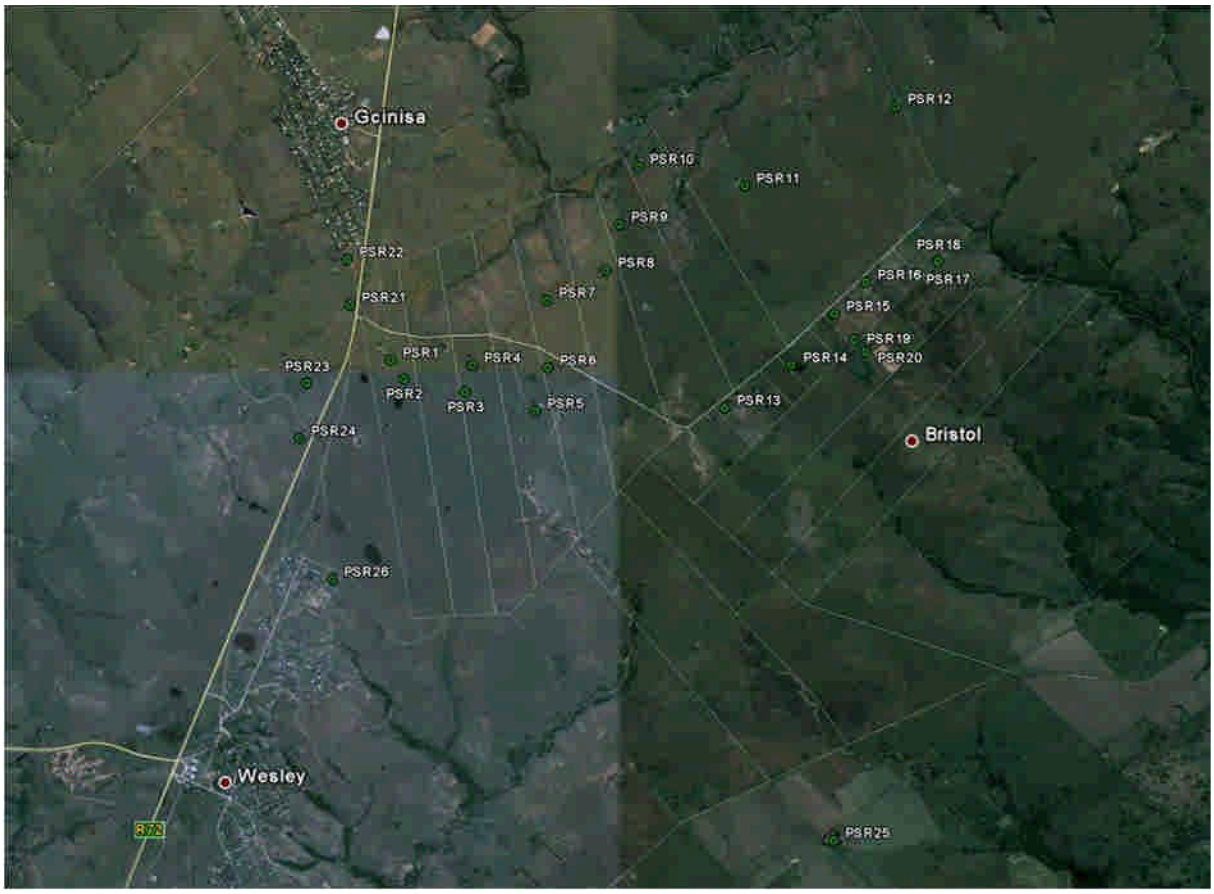


Figure 7.5: Aerial image indicating potentially sensitive receptors (marked as green dots) and properties for the proposed facility

From a visual perspective, the visual impact index below displays those areas with short distance, high frequency of visual exposure to the proposed facility (refer to Figure 7.6). A high viewer incidence and a predominantly negative perception would therefore have a higher value (greater impact) on the index. The core area of potentially high visual impact lies within a 5 km radius of the proposed facility.

From an environmental perspective, potentially sensitive areas including the a) drainage lines/watercourses and associated ecology, b) heritage/archaeological sites, as well as c) sensitive receptors have been highlighted as being potentially affected by the facility. These areas are illustrated on the consolidated sensitivity map for the site illustrated in Figure 7.7.

Power evacuation option number two is represented on this map. This option is preferred only on the condition that the associated substation position is shifted 200 m north-west in order to avoid areas of ecological sensitivity. Just Energy has, based on the findings of the EIA, revised the assessed layout to avoid this area of sensitivity

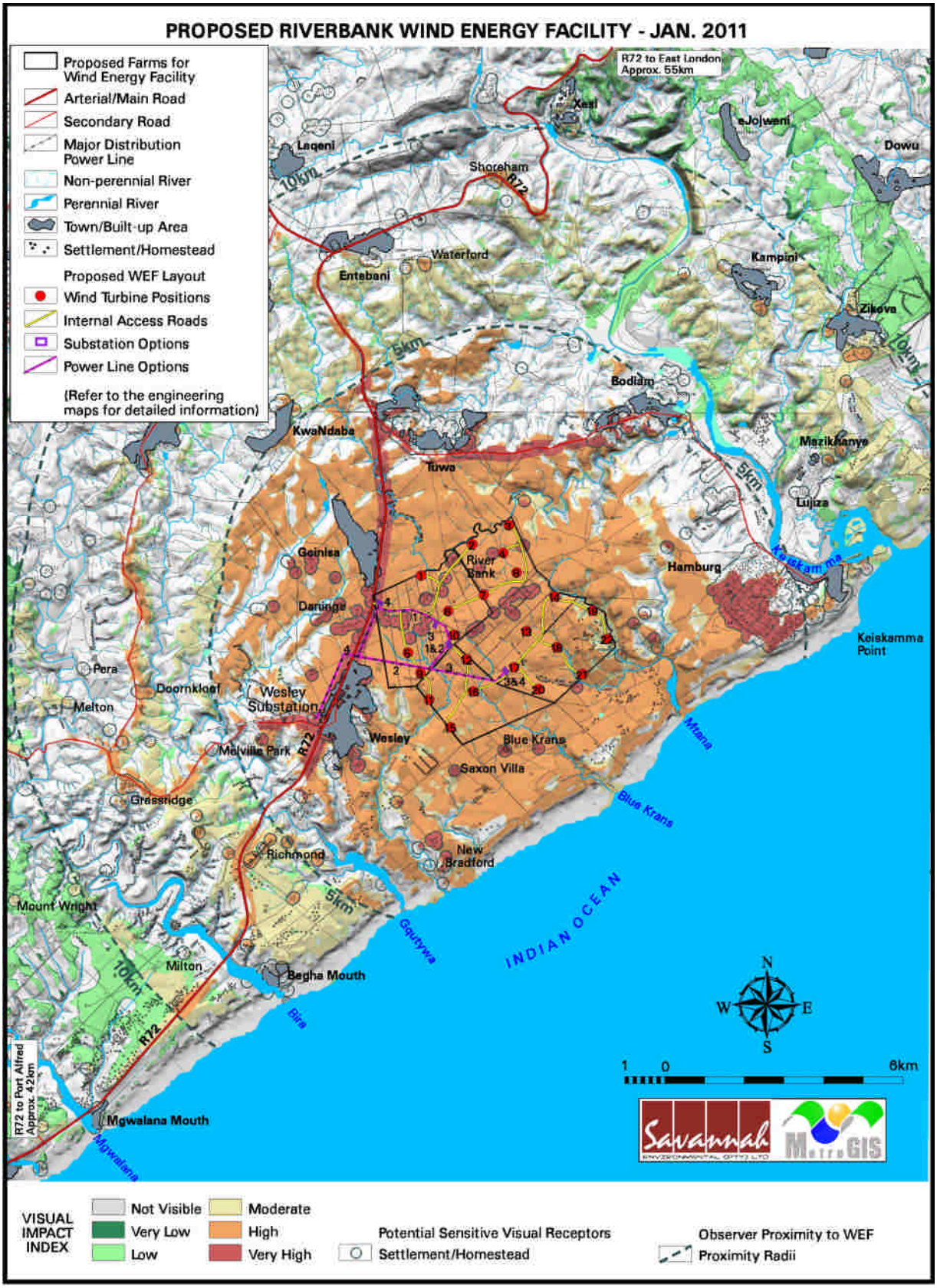


Figure 7.6: Visual impact index indicating the core area of impact within 5 km of the proposed facility

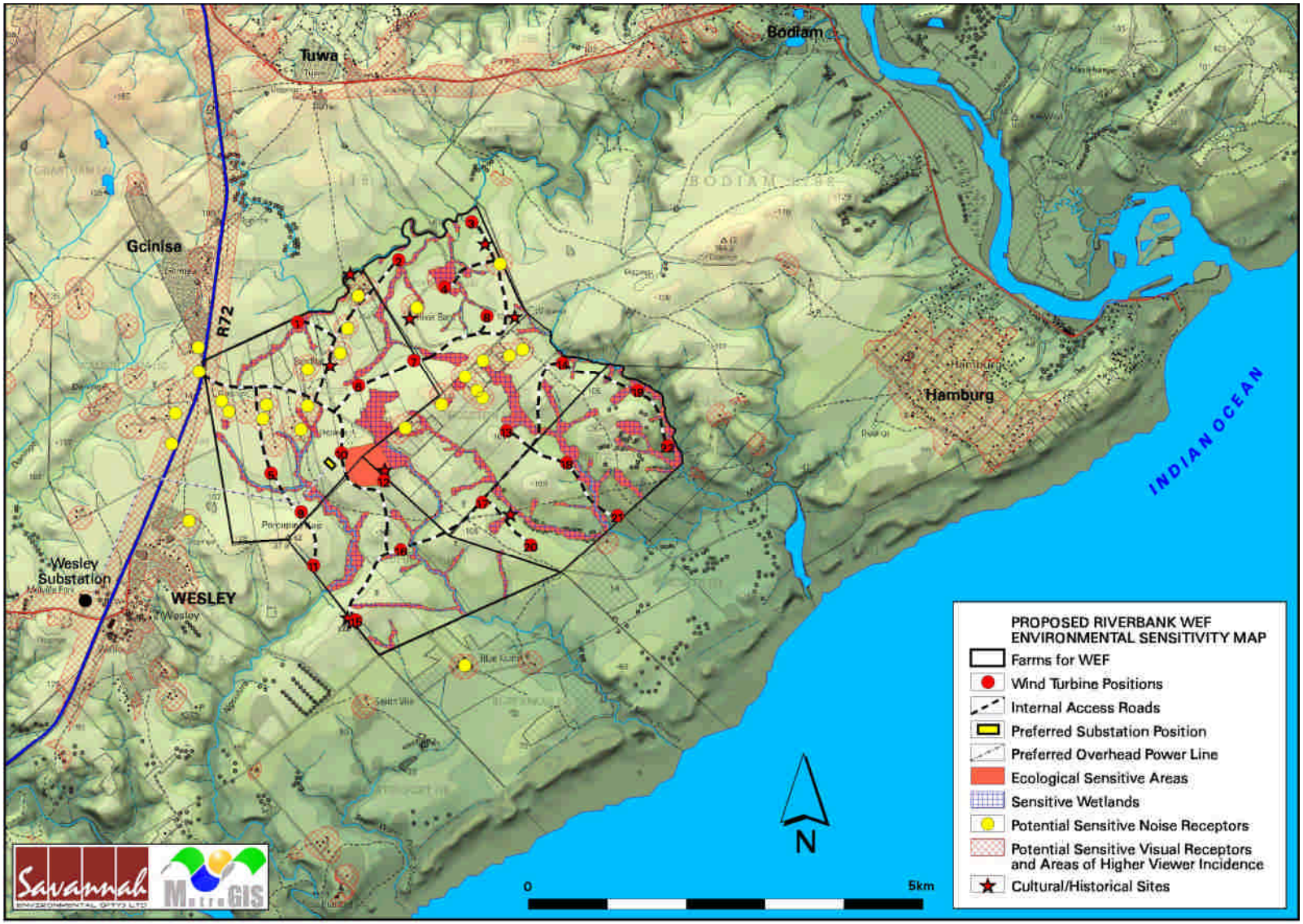


Figure 7.7: Combined sensitivity map for the Riverbank Wind Energy Facility site showing areas of high ecological sensitivity, heritage sites, and sensitive noise receptors

7.3.3 Impacts On and Benefits to the Social Environment

The Wesley community which has been targeted by Just Energy is predominantly rural (i.e. 95% of the population lives in the rural areas). Employment rates are low and poverty levels are high which impacts negatively on the municipality's ability to generate income from services charges and rates. According to the municipality's Integrated Development Plan, the economic base is narrow and there is a need to diversify and broaden the economy by creating employment opportunities and developing an environment conducive to economic growth. One of the priority development issues is that of infrastructure development, including affordable access to electricity.

Just Energy proposes to uplift and support this local community through a rental agreement and a cooperative agreement. Landowners will be awarded a rental income for the land where wind turbines will be located. Just Energy's development model is such that community land owners form part of the Project Company and obtain an equity share of the project. Just Energy has proposed collaborating with the Uncedo Lwethu Farmers Cooperative to establish a cooperative agreement where the funds from an equity shareholding can be managed and operated by the members of the community themselves. This shareholding will yield dividends, which can be applied to a range of social and economic development activities e.g. investments in local enterprise development, health care, education, and energy efficient housing. The agreement, working with service providers such as experienced micro-finance institutes will then implement a programme of investing in the community. Parameters will be laid down within the trust deeds that ensure that the overall social purpose of the funds cannot be changed, and which set out the social sectors to which the funds can be applied. Just Energy will work with the community to determine the social sectors that the funds will be used for, which may include sectors such as:

» Investing in small and medium sized businesses within the community and in the start up of new enterprises;
» Upgrading of low income housing, particularly with energy efficient measures, such as energy efficient stoves and insulation;
» Supporting health care in the community;
» Supporting education at all levels in the community;
» Supporting training and skills building within the community; and
» Supporting local socially focused community benefit organisations.

This upliftment of the community is considered a significant benefit from the project. Additional positive impacts include the creation of employment and business opportunities during the construction and operation phases. Furthermore limited skills development and training will be provided.

Some negative impacts are expected during both the construction phase and the operational phase of the wind energy facility. During the construction phase several impact of varying significance are expected and include:

» The impact of heavy vehicles on the existing roads;
» The presence of construction workers on site and the resultant impacts on family structures; and
» The risk of stock theft, poaching activities, damage to farm infrastructure and potential loss of farm land.

During the operational phase the following impacts may be experienced:

» Positive and/or negative of the tourism potential of the area
» An impact on the land use of the area as the permanently affected areas will not be suitable for any agricultural activities; however this area is small and constitutes less than 2% of the site.

7.3 Revision to the Design Layouts following the Review Period of the Draft EIA Report

The final chapter of the Draft EIA Report included recommendations from the EAP with respect to the layout options. One such recommendation stated that **Option 2** for the substation and power line is preferred, based on the recommendations of the specialist investigations. The Ecological Report recommended that **Option 2** would be considered suitable if substations 1 or 2 were shifted to the north-west to avoid an area of natural habitat that is of concern. This would mean that the substation and power line for options 1 and 2 would not infringe on this area of natural vegetation. Just Energy has taken cognisance of these recommendations and has revised the layout for Option 2 by moving the substation clear of this sensitive area. Furthermore the road between turbines 10 and 12 has been moved to avoid crossing through the same identified sensitive area. Figures 7.8 and 7.9 illustrate the original site sensitivity map, as well as the revised map which reflects the recent changes made to the layout by the developer to avoid identified areas of sensitivity.

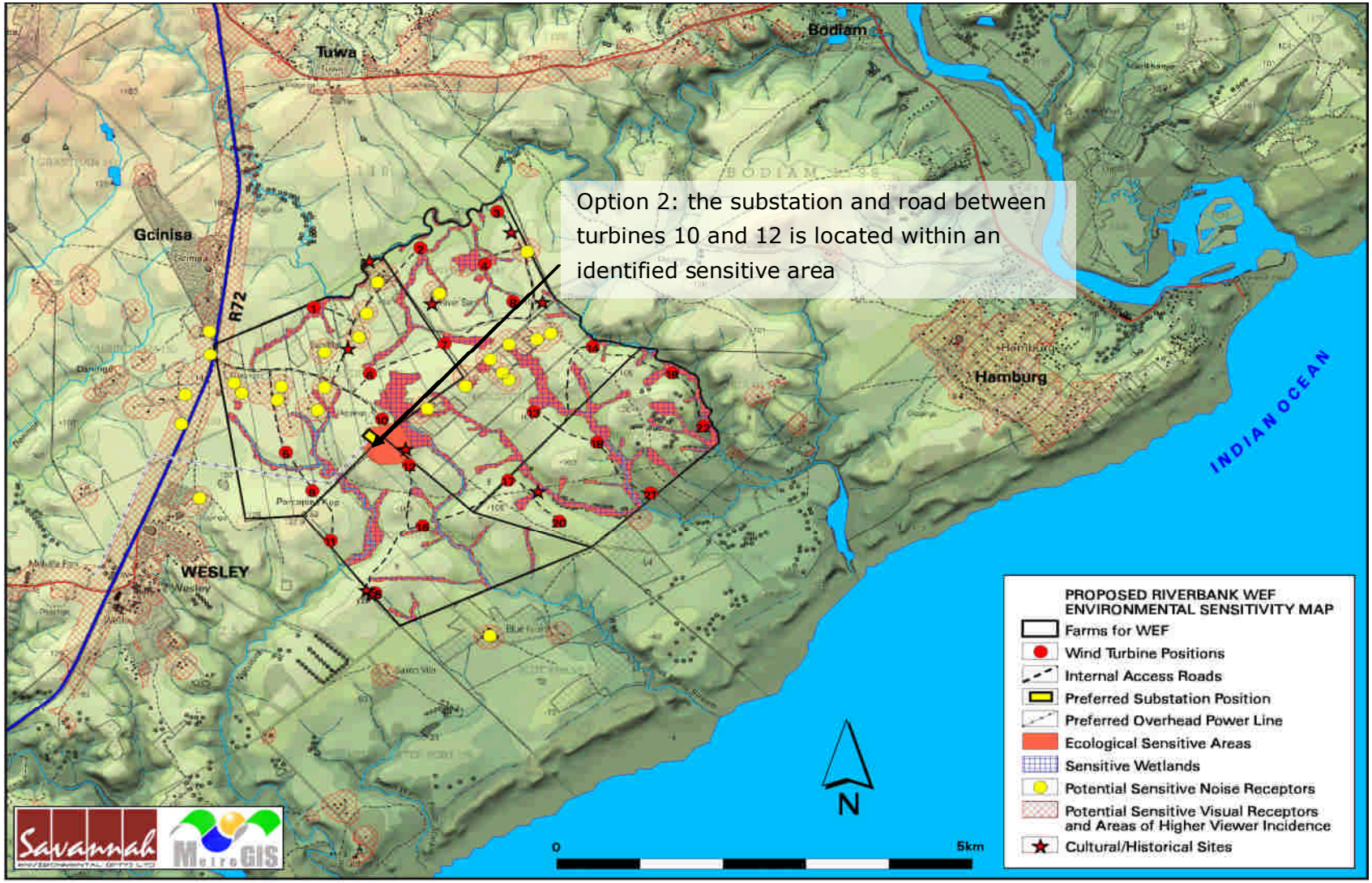


Figure 7.8: Original site sensitivity map produced for the Draft EIA Report indicating the position of the substation and access road in an ecologically sensitive area.

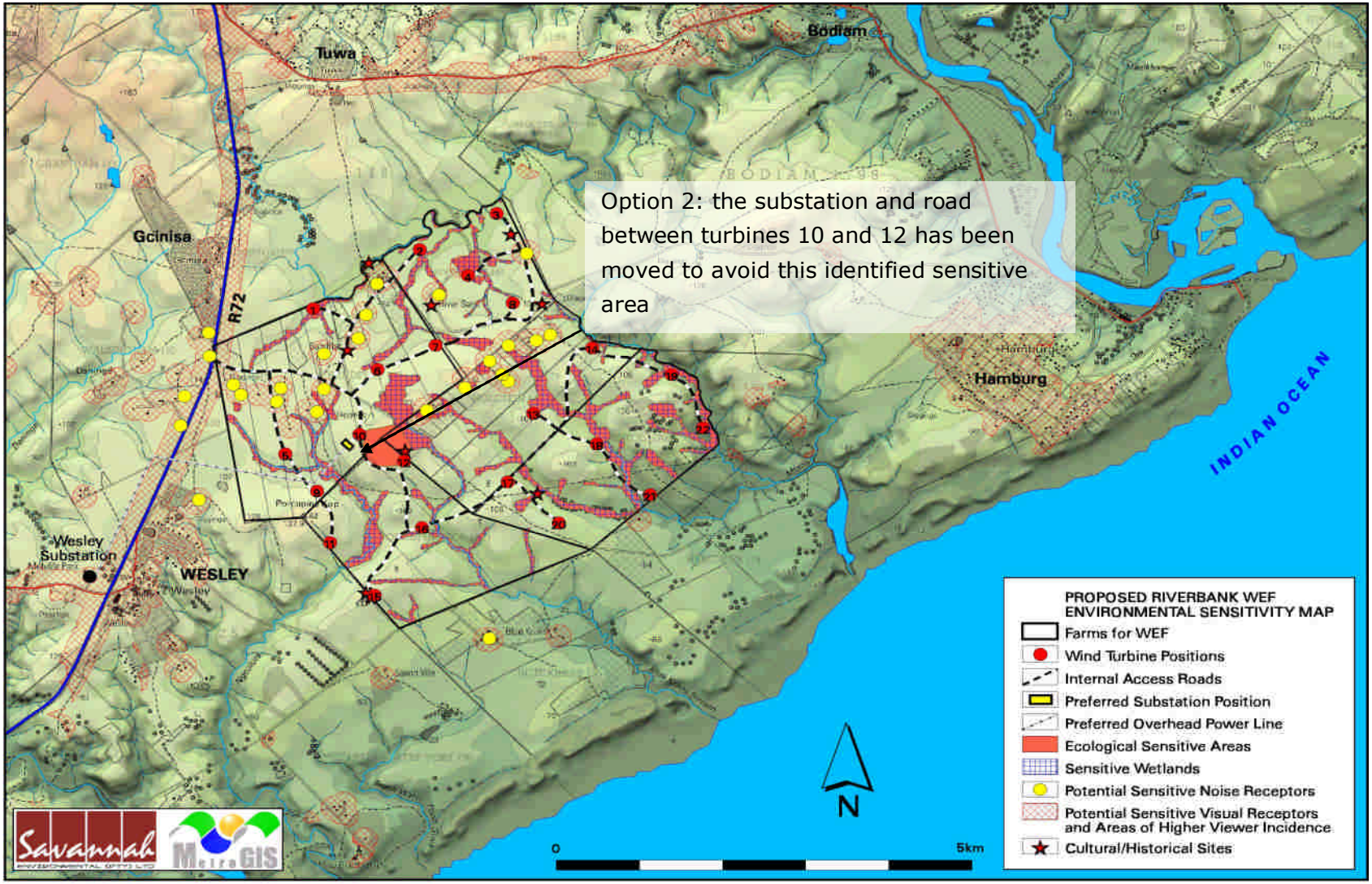


Figure 7.9: Revised site sensitivity map which indicates the revised site layout (taking ecological sensitivities identified during the EIA Phase into account)

7.4 Overall Conclusion (Impact Statement)

The technical viability of establishing a 22 turbine wind energy facility near Wesley in the Eastern Cape has been established by Just Energy. The positive implications of establishing a wind energy facility on the demarcated site include:

» The project would assist the South African government in reaching their set targets for renewable energy.
» The potential to harness and utilise good wind energy resources at an inland site would be realised.
» The National electricity grid in the Eastern Cape would benefit from (i.e. be strengthened) the additional generated power.
» Promotion of clean, renewable energy in South Africa.
» Landowners will be awarded a rental income for the land where wind turbines will be located.
» Through their role in project development, particularly in the area of building social and political acceptance for the project, the community will gain shareholding in the developed project via a Co-operative Agreement. This shareholding, yields dividends, which can be applied to a range of social and economic development activities e.g. investments in local enterprise development, health care, education, and energy efficient housing.
» Creation of local employment and business opportunities for the area, particularly for the residents of Wesley and members of the Uncedo Lwethu Farmers Cooperative.
» Opportunity to fund and implement an Operational Environmental Management Plan throughout the site, focussing on alien vegetation control, rehabilitation of disturbed areas with indigenous vegetation, and limitations on grazing by stock.

One of the drivers behind the proposed facility is the upliftment of the Wesley community. The Riverbank Wind Energy Facility will benefit this community during and beyond the facility's operational lifespan. The impact assessment has highlighted very few negative impacts of high significance associated with the proposed project. These impacts are associated with a) the loss or fragmentation of indigenous natural vegetation (from construction of turbines, power line, access roads); or b) the visual impact in the immediate vicinity of the facility (relating to turbines due to their height). Given the generally low to moderate significance of the potential negative impacts, the potential for impact mitigation, as well as the amendment to the layout, the positive social benefits outweigh the negative social and biophysical impacts.

The findings of the specialist studies undertaken within this EIA to assess both the benefits and potential negative impacts anticipated as a result of the proposed project conclude that there are **no environmental fatal flaws** that should prevent the proposed project from proceeding, provided that the recommended mitigation and management measures are implemented. The significance levels of the majority of identified negative impacts can generally be reduced by implementing the recommended

mitigation measures. With reference to the information available at this planning approval stage in the project cycle, the **confidence** in the environmental assessment undertaken is regarded as **acceptable**.

7.5 Overall Recommendations

Based on the nature and extent of the proposed project, the local level of disturbance predicted as a result of the construction and operation of the facility and associated substation(s) and power line(s), the findings of the EIA, and the understanding of the significance level of potential environmental impacts, it is the opinion of the EIA project team that the application for the proposed Riverbank Wind Energy Facility and associated infrastructure can be mitigated to an acceptable level, provided appropriate mitigation is implemented.

The following infrastructure would be included within an authorisation issued for the project:

Construction of the wind energy facility with up to **22 wind turbines**, and all **associated infrastructure** including:

- **Underground cabling** and electrical infrastructure between the turbines, to be lain underground where practical.
- **Substation** to facilitate the connection between the wind energy facility and the grid.
- **Power line** to connect to Eskom's existing Wesley Substation located approximately 5 km west of the project site.
- **Internal access roads** to each turbine.
- Ancillary infrastructure.

All four options substation/power line options investigated in the EIA Phase meet the acceptance level for environmental impacts, and will ensure that impacts are minimised to an acceptable level which can be managed through the implementation of an Environmental Management Plan. The preferred option for the substation location and power line is, however, **Option 2**, based on the recommendations of the specialist investigations. The key motivation for this preference is one substation and one power line, reducing the physical footprint required for development, and reducing the length of power line (reduced potential for avifauna collisions and for visual impact). Recommendations made with respect to the potential for Option 2 to impact on sensitive areas have been taken into account, and the layout for Option 2 has been revised by moving the substation clear of this sensitive area.

The following conditions would be required to be included within an authorisation issued for the project:

» All *practical* mitigation measures detailed within this report and all practical mitigation measures detailed within the specialist reports contained within Appendices E to L must be implemented.
» The draft EMP as contained within Appendix M of this report should form part of the contract with the Contractors appointed to construct and maintain the proposed wind energy facility, and will be used to ensure compliance with environmental specifications and management measures. The implementation of this EMP for all life cycle phases of the proposed project is considered key in achieving the appropriate environmental management standards as detailed for this project. This document should be considered as a dynamic document and must be updated as required throughout the life cycle of the facility.
» Final turbine positions have not been confirmed at this stage. A detailed site specific EMP should be conducted once the exact position of the infrastructure is finalised. Specifications from these details surveys must be incorporated into the project EMP.
» Power evacuation Option 2 should be constructed with the revised layout produced following the review of the Draft EIA Report.
» Disturbed areas should be rehabilitated as quickly as possible and an on-going monitoring programme should be established to detect and quantify any alien species.
» In terms of geological impacts, the natural drainage lines/watercourses are regarded as being of high sensitivity with severe erosion currently taking place. Therefore, these areas, as well as the 32 m buffer from the drainage lines, are regarded as no-go areas.
» A monitoring programme should be undertaken by a suitably qualified and independent bat specialist to determine the need for mitigation measures during the operational phase.
» The monitoring protocols as required by Appendix F of this report for avifauna should be implemented. A full avifaunal site specific EMP must be conducted during the final design stage to further deal with the impacts and how best to mitigate for these impacts. It is furthermore suggested that a monitoring program be included in the project in order to understand the nature of impacts on avifauna due to wind energy facilities on the site and in South Africa.
» Should the layout (or type of wind turbines used) change significantly, it is recommended that the new layout be remodelled/reviewed in terms of the potential noise impact by an independent acoustics specialist.
» Quarterly monitoring noise monitoring at the potential sensitive receptors (i.e. PSR11, PSR12 and PSR20) is recommended to be conducted by an approved noise inspection authority for the first year of operation (refer to Appendix K). Noise monitoring must be continued as long as noise complaints are registered.

- In order to enhance the local employment and business opportunities, mitigation/enhancement measures listed in the Social Impact Assessment should be implemented.
- Construction activities which involve the movement of heavy machinery and equipment on site should ideally be undertaken during the dry season in order to minimise erosion and the risk of sedimentation of watercourses. Where construction activities are undertaken within the rainy season, mitigation measures must be implemented to avoid impacts on watercourses and impacts as a result of erosion.
- During construction, unnecessary disturbance to habitats should be strictly controlled and the footprint of the impact should be kept to a minimum.
- A comprehensive stormwater management plan should be compiled for managing the hard surfaced areas of the site.
- If at any stage during the construction phase any heritage resource, or semblance of a fossil were to be observed, the occurrence should be reported to either the Albany Museum or Rhodes University in Grahamstown.
- Applications for all other relevant and required permits required to be obtained by Just Energy must be submitted to the relevant regulating authorities. This includes permits for the transporting of all components (abnormal loads) to site, disturbance to heritage sites, disturbance of protected vegetation, and disturbance to any riparian vegetation or wetlands.
- Following the final design phase of the facility, a final layout must be submitted to DEA for review and acceptance.

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