ENVIRONMENTAL IMPACT ASSESSMENT PROCESS
DRAFT SCOPING REPORT

PROPOSED ABERDEEN 200MW WIND FARM, WEST OF ABERDEEN

EASTERN CAPE PROVINCE
(DEA Ref: 12/12/20/2211)

DRAFT FOR PUBLIC REVIEW
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PROJECT DETAILS

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Title	:	Environmental Impact Assessment Process Draft Scoping Report: Proposed Aberdeen 200MW Wind Farm west of Aberdeen in the Eastern Cape Province
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PURPOSE OF THE DRAFT SCOPING REPORT

Eskom Holdings Limited is currently undertaking an Environmental Impact Assessment (EIA) process to determine the environmental feasibility of a proposed wind farm on a site west of Aberdeen, in the Eastern Cape Province. Eskom Holdings SOC Limited has appointed Savannah Environmental, as independent environmental consultants, to undertake the EIA. The EIA process is being undertaken in accordance with the requirements of the National Environmental Management Act (NEMA; Act No. 107 of 1998).

Scoping is an important part of the EIA process, as it helps to ensure that the impact assessment is appropriately focussed. The main objectives of the Scoping process are:

» To engage with stakeholders at an early stage of the development so that they may contribute their views with regards to the proposed project;
» To identify potential issues and impacts associated with the proposed development;
» To define the scope of the Environmental Impact Assessment (EIA);
» To define the methodology that is required for the EIA; and
» To describe the plan of study for the EIA.

In terms of NEMA, the Scoping Report is submitted to the competent authority (i.e. the National Department of Environmental Affairs (DEA)) as part of the decision-making process with regard to the proposed wind farm. The Scoping Report is also intended to provide sufficient background information to other Organs of State, non-statutory bodies, the general public, organisations and local communities in order to obtain their commentary and input on the proposed development. The Scoping Phase of the EIA process identifies and describes potential issues associated with the proposed project, and defines the extent of the studies required within the EIA Phase of the process. The EIA Phase will assess those identified potential environmental impacts and benefits associated with all phases of the project including design, construction, operation and decommissioning, and will recommend appropriate mitigation measures for potentially significant environmental impacts.

The Scoping Report consists of eleven sections:

» **Chapter 1** provides background to the proposed wind farm project and the environmental impact assessment
» **Chapter 2** provides the strategic context for energy planning in South Africa
» **Chapter 3** describes wind energy as a power option and provides insight to technologies for wind turbines

- **Chapter 4** provides a description of the processes followed in the determination of acceptable sites for the development of the proposed Aberdeen 200MW Wind Farm Project
- **Chapter 5** outlines the process which was followed during the Scoping Phase of the EIA process, including the consultation program that was undertaken and input received from interested parties
- **Chapter 6** describes the existing biophysical and socio-economic environment
- **Chapter 7** describes the activities associated with the project (project scope)
- **Chapter 8** presents the evaluation of environmental impacts
- **Chapter 9** presents the conclusions of the scoping evaluation
- **Chapter 10** describes the Plan of Study for EIA
- **Chapter 11** provides a list of references and information sources used in undertaking this Scoping Study.

The Draft Scoping Report provides the public with an opportunity to verify that all potential issues associated with the proposed project have been identified through this scoping study, and provides an opportunity for additional key issues for consideration to be raised. The Final Scoping Report will incorporate all comments received prior to submission to the National Department of Environmental Affairs (DEA).

INVITATION TO COMMENT ON THE DRAFT SCOPING REPORT

Members of the public, local communities and stakeholders are invited to comment on the Draft Scoping Report which has been made available for public review and comment at the following locations from **17 February to 18 March 2012.**

» www.savannahsa.com
» www.eskom.co.za/eia
» Aberdeen Library, Andries Pretorius Street, Aberdeen
» Horse Shoe Library, Parsonage Street, Graaff Reinet

Please submit your comments to
Shawn Johnston of Sustainable Futures ZA PO Box 749, Rondebosch, Cape Town, 7701 Tel: 083 325 9965 Fax: 086 510 2537 E-mail: swjohnston@mweb.co.za
The due date for comments on the Draft Scoping Report is **18 March 2012**

Comments can be made as written submission via fax, post or e-mail.

SUMMARY

Background and Project Overview

Eskom Holdings Limited (SOC) (State Owned Company) is proposing the establishment of a wind farm and associated infrastructure on an identified site which is located approximately 24 km west of the town of Aberdeen in the Eastern Cape Province, within the Camdeboo Local Municipality. This proposed project will be referred to as the **Aberdeen 200 MW Wind Farm**. This development is proposed to comprise a cluster of **up to 150 wind turbines** (typically described as a wind energy facility or a wind farm) to be constructed over an area of approximately **8 198 ha** in extent.

Associated infrastructure proposed includes:

- A cluster of between **100 and 150 wind turbines** to be constructed over an area of ~ **8 198 ha** in extent
- **Concrete foundations** to support the turbine towers
- **Cabling** between the turbines to be lain underground
- An on-site **substation** to facilitate the connection between the facility and the electricity grid
- An **overhead power line** (400kV) feeding into Eskom's electricity grid at the Droërivier Substation, approximately 140 km from the site[1]
- **Main access road** to site
- **Internal access roads** between wind turbines
- **External roads** to access the site may be required
- **Borrow pits** within the site for the construction of access roads
- **Office / Workshop** area for operations, maintenance and storage
- **Temporary water storage** for construction and small storage for Operation
- **Storage of fuel** during construction
- Small **Information centre and Operational & Maintenance building**

The identified site (as assessed in this draft scoping report) for the establishment of the proposed Aberdeen 200 MW Wind Farm is as follows:

- Portion 3 of Sambokdoorns 92
- RE of Portion 4 of Sambokdoorns 92
- RE of Sambokdoorns 92
- Portion 1 of Klipdrift 73
- Portion 2 of Farm 94, and
- RE of Portion 2 of Farm 94.

The nature and extent of this facility, as well as potential environmental impacts associated with the construction of a facility of this nature is explored in more detail in this Scoping Report.

The Scoping Study for the proposed Aberdeen 200 MW Wind Farm west of Aberdeen in the Eastern Cape Province has been undertaken in accordance with the EIA Regulations

[1] Note that the power line is the subject of a separate EIA process.

published in Government Notice 33306 of GN R543, R544, R545 and R546 (18 June 2010), in terms of Section 24(5) of the National Environmental Management Act (NEMA; Act No 107 of 1998).

Environmental Impact Assessment

The scoping phase for the proposed project forms part of the EIA process and has been undertaken in accordance with the EIA Regulations. The Scoping Report aimed to identify potential issues associated with the proposed project, and define the extent of studies required within the EIA. This was achieved through an evaluation of the proposed project involving specialists with expertise relevant to the nature of the project and the study area, the project proponent, as well as a consultation process with key stakeholders that included both relevant government authorities and interested and affected parties (I&APs).

A comprehensive public participation process is being undertaken in accordance with Regulation 54 of Government Notice No R543 of 2010 during the Scoping phase of this EIA process. This public participation process comprises the following:

» **Notification of the EIA Process** in printed media and on site, as well as through written notification to identified stakeholders and affected landowners.
» **Identification and registration** of I&APs and key stakeholders.
» Compilation and distribution of a **Background Information Document** (BID) to all identified I&APs and key stakeholders.
» **On-going consultation** with identified I&APs and stakeholders, including Telephonic communication, Focus Group Meetings and one-one-one meetings.
» Compilation and maintenance of a **database** containing the names and addresses of all identified I&APs and key stakeholders.
» Preparation of a **Comments and Response Report** detailing key issues raised by I&APs as part of the EIA Process.

Evaluation of the Proposed Project

The overarching objective for the wind farm planning process is to maximise electricity production through **exposure to the wind resource**, while minimising infrastructure, operational and maintenance costs, as well as **social and environmental impacts**. Local level environmental and planning issues will now be considered within **site-specific studies** to be undertaken as part of the EIA for the project. The assessments through the EIA process will assist in delineating areas of environmental sensitivity within the broader site and ultimately inform the placement of the wind turbines and associated infrastructure on the site in order to

minimise impacts on the environment.

Issues identified through this scoping study as being potentially associated with the proposed Aberdeen Wind Farm west of Aberdeen are summarised below.

Positive potential impacts related to the **construction/ Decommissioning phases** of the wind farm include, *inter alia*:

» Positive: Social Impacts
  * Opportunistic labour in-migration
  * Skills development
  * Job creation

Negative potential impacts related to the **construction/ Decommissioning phases** of the wind farm include, *inter alia*:

» Visual impacts associated with the construction of the farm and associated infrastructure
» Impacts on Soils and Agricultural Potential(although anticipated to be low to negligible, it will still have to be investigated)
» Impacts on Vegetation and terrestrial Fauna
» Impacts on Avifauna
» Impacts on Bats
» Impacts on Heritage
» Impacts on Noise sensitive receptors
» Social Impacts

Positive potential impacts related to the **operation** of the wind farm include, *inter alia*:

» Provision of a clean, renewable energy source for the national grid
» stabilisation of power supply in the Eastern Cape
» Social Impacts:
  * Creation of opportunities to local business during the operational phase, including but not limited to, provision of security, staff transport, and other services
  * Potential up and down-stream economic opportunities for the local, regional and national economy
» Assistance towards provision of secure power supply in South Africa

Negative potential impacts related to the **operation** of the wind farm include, *inter alia*:

» Visual impacts
  * Visual exposure of wind turbines and associated infrastructure
» Impacts on Avifauna and bats
  * Increased mortality of birds/bats due to collision with turbine blades
  * Increased mortality of birds/bats due to Electrocution with associated power lines[2]
  * Habitat loss
» Noise impacts
» Heritage Impacts
» Social Impacts:
  * impacts on existing tourism and tourism potential of the area

The majority of potential impacts identified to be associated with the construction and operation of the proposed wind farm are anticipated to be localised and restricted to the proposed site. No environmental fatal flaws were identified to be associated with the site. However, areas of potential sensitivity were identified through the scoping phase. These areas of sensitivity are

[2] Power line to be assessed in a separate EIA process

illustrated in the sensitivity map (Refer to **Figure 2)**.

The potentially sensitive areas/environmental features that have been identified include:

» Areas of visual exposure within (but not restricted to) 10 km of the proposed wind energy facility site such as homesteads and observers travelling along major and gravel roads,
» Potentially sensitive noise receptors as indicated in Figure 2 of this report,
» Areas of wetlands and watercourse sensitivity as indicated in Figure 2 of this report,
» Areas of bat sensitivity as indicated in Figure 2.

The sensitivity map is a rough scale estimate of sensitivity on the site, and these areas will be subject to survey and ground-truthing during the EIA phase of the project. These potentially sensitive areas will, therefore, be further investigated and assessed through detailed specialist studies (including field surveys) during the EIA phase.

It must be noted that the power line proposed to connect the wind farm and the grid at the Droeriver Substation near Beaufort West will be assessed in a separate EIA process, which is currently in the pre-application phase.

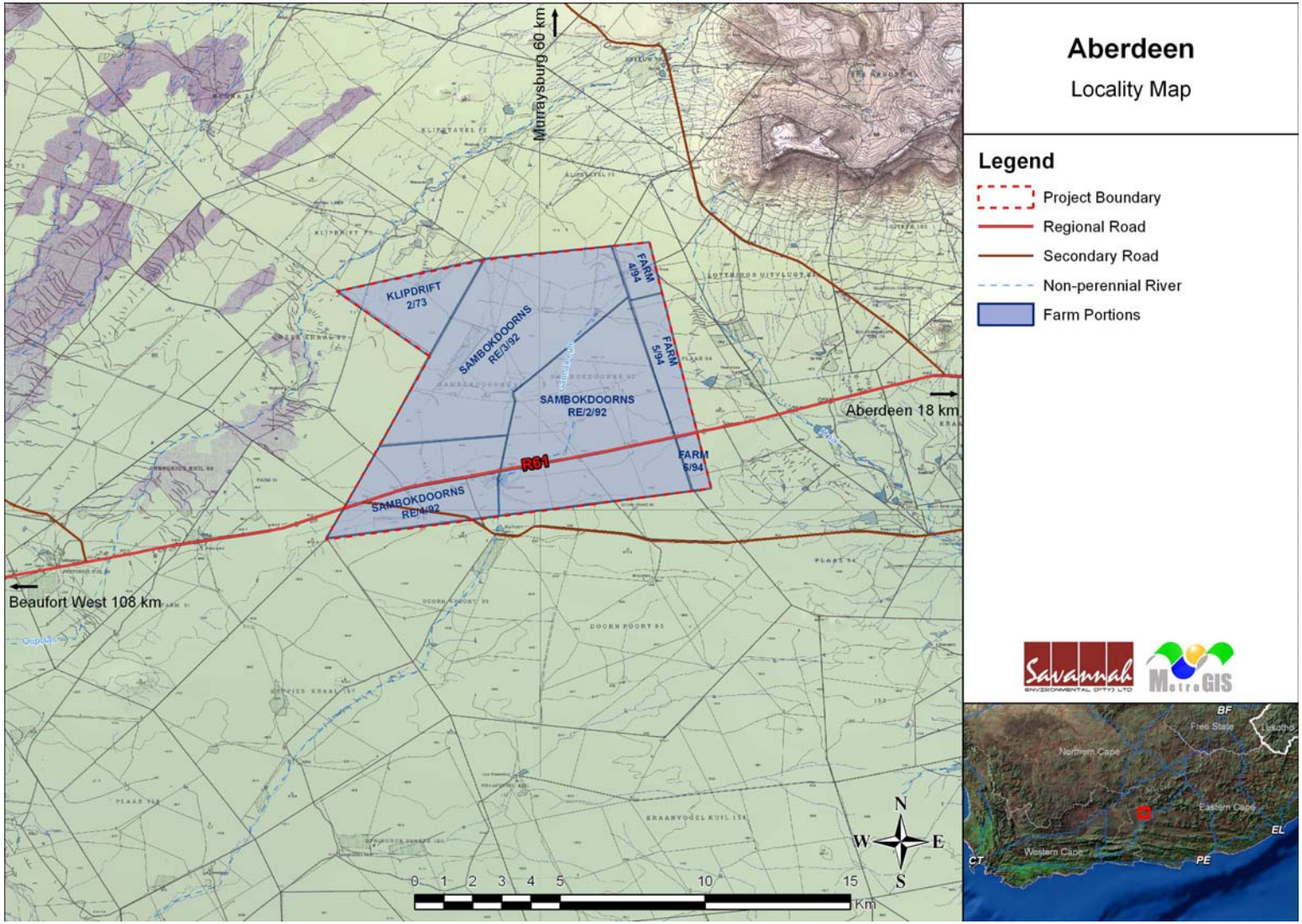

Figure 1: Locality map showing the study area for the establishment of the proposed Aberdeen 200MW Wind Farm

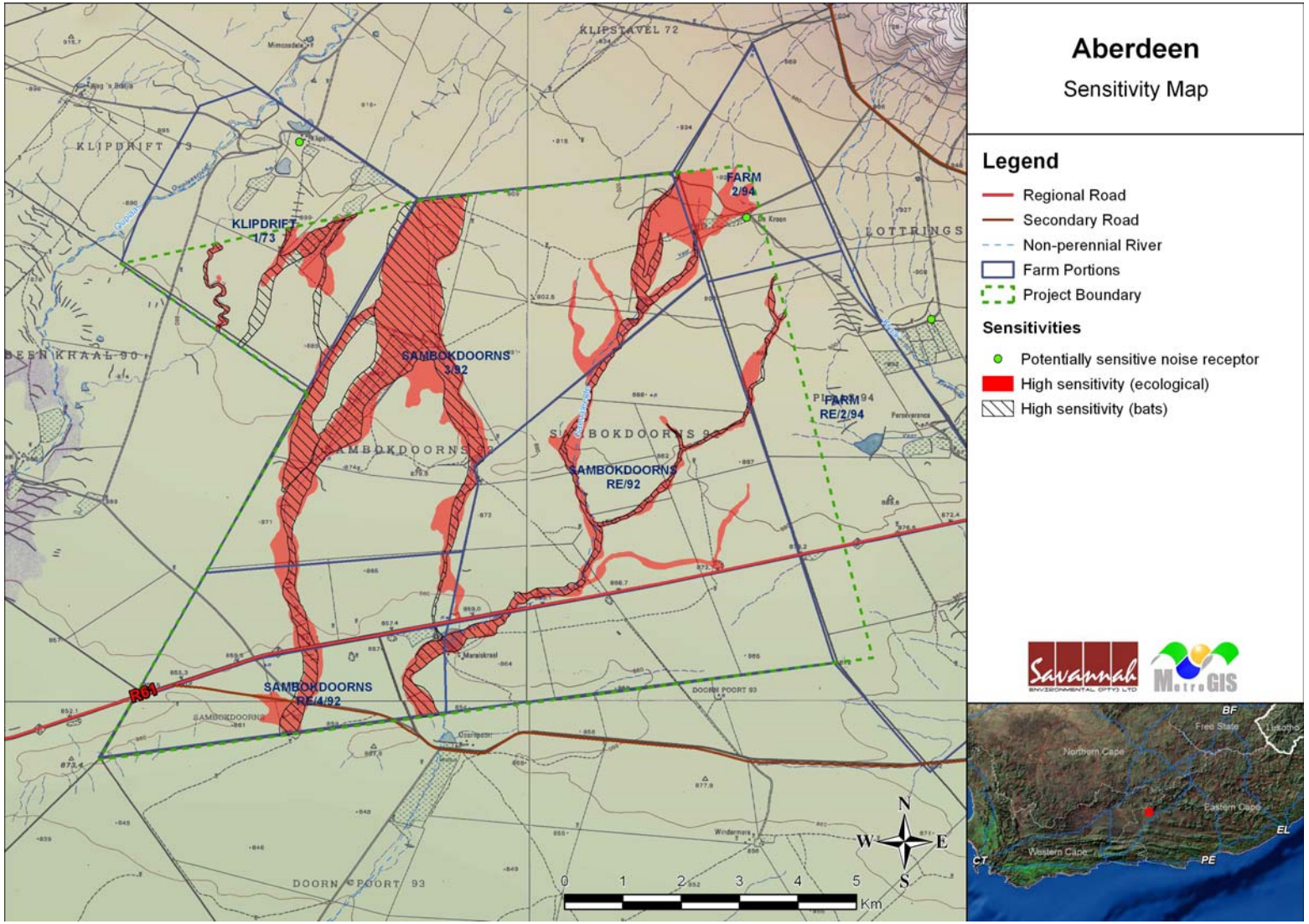

Figure 2: Environmental Sensitivity Map for the proposed Aberdeen 200 MW Wind Farm, west of Aberdeen, in the Eastern Cape.

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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 turbine's 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 of time 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 a wind turbine's 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 as a result 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 as a result 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 general 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).

Regional Methodology: The Western Cape Department of Environmental Affairs and Development Planning (DEA&DP) have developed a guideline document entitled *Strategic Initiative to Introduce Commercial Land Based Wind Energy Development to the Western Cape - Towards a Regional Methodology for Wind Energy Site Selection* (Western Cape Provincial Government, May 2006). The methodology proposed within this guideline document is intended to be a regional level planning tool to guide planners and decision-makers with regards to appropriate areas for wind energy development (on the basis of planning, environmental, infrastructural and landscape parameters).

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. It is approximately 80 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 80 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.

ABBREVIATIONS AND ACRONYMS

BID	Background Information Document
CBOs	Community Based Organisations
CDM	Clean Development Mechanism
CSIR	Council for Scientific and Industrial Research
CO_2	Carbon dioxide
D	Diameter of the rotor blades
DAFF	Department of Forestry and Fishery
DEA	National Department of Environmental Affairs
DEDEA	Eastern Cape Department of Economic Development and Environmental Affairs
DME	Department of Minerals and Energy
DOT	Department of Transport
DWA	Department of Water Affairs
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
GIS	Geographical Information Systems
GG	Government Gazette
GN	Government Notice
GWh	Giga Watt Hour
Ha	Hectare
I&AP	Interested and Affected Party
IDP	Integrated Development Plan
IEP	Integrated Energy Planning
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)
SAHRA	South African Heritage Resources Agency
SANBI	South African National Biodiversity Institute
SANRAL	South African National Roads Agency Limited
SDF	Spatial Development Framework

INTRODUCTION CHAPTER 1

Eskom Holdings Limited (SOC) (State Owned Company) is proposing the establishment of a wind farm and associated infrastructure on an identified site which is located approximately 24 km west of the town of Aberdeen in the Eastern Cape Province, within the Camdeboo Local Municipality. This proposed project will be referred to as the **Aberdeen 200 MW Wind Farm**. This development is proposed to comprise a cluster of up to 150 wind turbines (typically described as a wind energy facility or a wind farm) to be constructed over an area of approximately 8 198 ha in extent.

The nature and extent of the proposed facility, as well as potential environmental impacts associated with the construction, operation and decommissioning phases of a facility of this nature is explored in more detail in this Draft Scoping Report. The Scoping Report consists of eleven sections:

» **Chapter 1** provides background to the proposed wind farm project and the environmental impact assessment
» **Chapter 2** provides the strategic context for energy planning in South Africa
» **Chapter 3** describes wind energy as a power option and provides insight to technologies for wind turbines
» **Chapter 4** provides a description of the processes followed in the determination of acceptable sites for the development of the proposed Aberdeen 200MW Wind Farm Project
» **Chapter 5** outlines the process which was followed during the Scoping Phase of the EIA process, including the consultation program that was undertaken and input received from interested parties
» **Chapter 6** describes the existing biophysical and socio-economic environment
» **Chapter 7** describes the activities associated with the project (project scope)
» **Chapter 8** presents the evaluation of environmental impacts
» **Chapter 9** presents the conclusions of the scoping evaluation
» **Chapter 10** describes the Plan of Study for EIA
» **Chapter 11** provides a list of references and information sources used in undertaking this Scoping Study.

1.1. The Need for the Proposed Project

Internationally there is increasing pressure on countries to increase their share of renewable energy generation due to concerns such as climate change and the need to reduce the dependence upon fossil fuels, such as oil and coal for energy and thus reduce the volume of greenhouse gasses emitted into the atmosphere.

Grid connected renewable energy is currently the fastest growing sector in the global energy market, and wind energy is the most economic of the sources of renewable energy. Installed global wind capacity was in the order of 90GW in 2008, with total world installed capacity having doubled since 2004.

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) and the National Energy Regulator of South Africa (NERSA). The South African Government has recognised the need to diversify the mix of energy generation technologies within the country, and also to reduce the country's reliance on fossil fuel derived power generation. As a result, and in order to meet the long-term goal of a sustainable renewable energy industry, the South African Government has set a target of 17GW renewable energy contribution to new power generation capacity by 2030. This is to be produced mainly from biomass, **wind**, solar and small-scale hydro. In response to Government's commitments, and as part of its Climate Change Strategy, Eskom plans to include at least 1 600 MW of renewable energy within the electricity generation mix (*extract from Eskom's Climate Change Commitment - The 6 Point Plan*). The purpose of the proposed Aberdeen 200 MW Wind Farm project is to add new capacity for generation of renewable energy to the national electricity mix and to aid in meeting this goal.

Local level issues are now being considered within **site-specific studies** and assessment through the EIA process in order to delineate areas of sensitivity within the broader area. A preliminary layout of the components of the wind farm has been developed by Eskom and will be further assessed in the EIA phase of the project. Once environmentally constraining factors have been determined through the EIA process, and site-specific wind data is available from wind monitoring on site, the layout of the wind turbines and associated infrastructure can be appropriately planned. Specialist software is available to assist developers in selecting the optimum position, with respect to environmental considerations, for each turbine before the project is constructed. This layout will then inform the positioning of other infrastructure such as the internal substation and access roads, and other ancillary infrastructure.

The scope of the proposed Aberdeen 200 MW Wind Farm project, including details of all elements of the project for each of the three development phases (for the construction, operation and decommissioning phases) is discussed in more detail in Chapter 7.

1.2. Background to the Project

As a precursor to initiating an Environmental Impact Assessment (EIA) process, Eskom embarked on a wind resource research programme, as well as a site

identification and selection process to determine areas suitable for wind energy development in South Africa. Meteorological conditions are critically important when considering the siting of wind turbines and identifying ideal wind farm sites. Ultimately, the success of the facility is dependent on the available wind resource of a particular site – i.e. wind speed, turbulence, spatial and temporal variations in the wind climate, and how the wind resource is affected by terrain.

According to the South African Wind Resource Database compiled by the National Department of Minerals and Energy (DME), the Council for Scientific and Industrial Research (CSIR) and Eskom, Aberdeen in the Eastern Cape has been identified to experience some of the highest wind speeds in South Africa. Eskom studied this area further and is confident that the potential for the wind resource in this area will support the development of a wind farm. In addition, this area further supports other technical requirements for a wind farm in terms of land availability and accessibility, and accessibility of the electricity grid to meet transmission integration requirements for a facility of this nature.

In 2009 and 2010, Eskom undertook a regional site identification and selection process (refer to Chapter 4 for details of the site identification process) in the South Western region of South Africa to determine and delineate suitable sites for commercial wind energy development. In order to assist in addressing the challenge of ensuring that wind energy projects meet economic (including technical), social and environmental sustainability criteria, the study was based on the Western Cape Provincial guidelines document entitled *Strategic Initiative to Introduce Commercial Land Based Wind Energy Development to the Western Cape - Towards a Regional Methodology for Wind Energy Site Selection* (Western Cape Provincial Government, May 2006) developed by the Western Cape Department of Environmental Affairs and Development Planning (DEA&DP).

The regional site identification process aimed to determine and delineate areas suitable for wind energy development and included the consideration of sites/areas of special environmental importance and planning criteria, as well as issues relating to landscape character, value, sensitivity and capacity. These aspects were then balanced with technical constraining factors affecting the siting of a wind farm, including the wind resource (wind potential diminishing with distance from the coastline), land availability, accessibility and existing grid infrastructure. More details in this regard are included in Chapter 4 of this report.

It was acknowledged that a proactive identification of a location/site appropriate for the introduction of wind energy technology would enhance the viability of the project and inform the scope of the required Environmental Impact Assessment.

1.3. Project Overview

Through the regional site identification process, a broader area falling within the Camdeboo Local Municipality (depicted on Figure 1.1) was identified by Eskom (in conjunction with the EIA consultants) as being potentially suitable for wind energy development. This area was put forward for consideration within an EIA. This area (~8 198 ha in extent) comprises the following farms:

» Portion 3 of Sambokdoorns 92
» RE of Portion 4 of Sambokdoorns 92
» RE of Sambokdoorns 92
» Portion 1 of Klipdrift 73
» Portion 2 of Farm 94, and
» RE of Portion 2 of Farm 94.

The overarching objective for the wind farm planning process is to maximise electricity production through **exposure to the wind resource**, while minimising infrastructure, operational and maintenance costs, as well as **social and environmental impacts**. As **local level environmental and planning issues** were not assessed in sufficient detail through the regional level site identification process, these issues must now be considered within **site-specific studies** and assessments through the EIA process in order to delineate areas of sensitivity within the broader site and ultimately inform the placement of the wind turbines and associated infrastructure on a site.

The wind farm is proposed to accommodate between **100 and 150 turbines** (1.5 –3 MW industry standard turbines). The total facility would, however, not exceed 200 turbines on the proposed site. The performance of the turbines is determined by disturbances to the wind resource, which requires that they are appropriately spaced. The turbines and associated infrastructure is, therefore, required to be positioned over an area of approximately 8 198 ha, but avoiding sensitive areas.

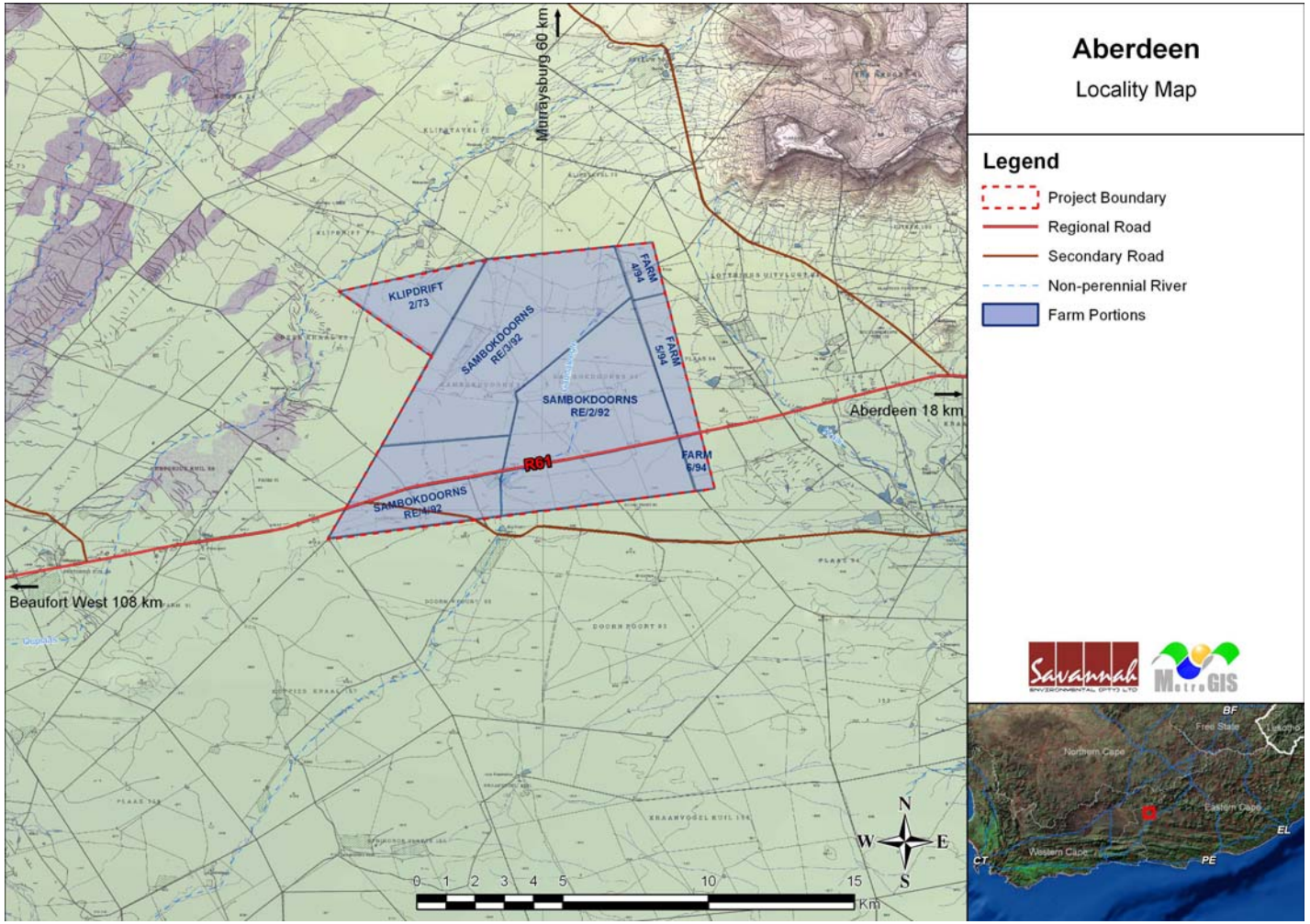


Figure 1.1: Locality map showing the study area for the establishment of the Aberdeen 200MW Wind Farm. The project boundary is indicated by the dashed red line.

The infrastructure associated with the total Wind farm would, therefore, include:

» A cluster of between **100 and 150 wind turbines** to be constructed over an area of ~ **8 198 ha** in extent
» **Concrete foundations** to support the turbine towers
» **Cabling** between the turbines to be lain underground
» An on-site **substation** to facilitate the connection between the facility and the electricity grid
» An **overhead power line** (400kV) feeding into Eskom's electricity grid at the Droërivier Substation, approximately 140 km from the site[3]
» **Main access road** to site
» **Internal access roads** between wind turbines
» **External roads** to access the site may be required
» **Borrow pits** within the site for the construction of access roads
» **Office / Workshop** area for operations, maintenance and storage
» **Temporary water storage** for construction and small storage for Operation
» **Storage of fuel** during construction
» Small **Information centre and Operational & Maintenance building**

The scope of the proposed wind farm project, including details of all elements of the project (for the construction, operation and decommissioning phases) is discussed in detail in Chapter 7.

Specialist software is available to assist developers in selecting the optimum position for each turbine before the project is constructed. This layout will then inform the positioning of other infrastructure such as access roads and substation/s. The preliminary positioning or detailed layout of the components of this wind plant will be developed at the EIA phase of the project. Final placement will be informed by the outcomes of the EIA as well as from the results of the on-site wind monitoring.

1.4. Requirement for an Environmental Impact Assessment Process

The proposed wind farm is subject to the requirements of the EIA Regulations published in terms of Section 24(5) of the National Environmental Management Act (NEMA, Act No. 107 of 1998). This section provides a brief overview of the EIA Regulations and their application to this project.

NEMA is the national legislation that provides for the authorisation of "listed activities". In terms of Section 24(1) of NEMA, the potential impact on the environment associated with these activities must be considered, investigated, assessed and reported on to the competent authority that has been charged by

[3] Note that the power line is the subject of a separate EIA process.

NEMA with the responsibility of granting environmental authorisations. As this is a proposed electricity generation project and thereby considered to be of national importance, the National Department of Environmental Affairs (DEA) is the competent authority and the Eastern Cape Department of Economic Development and Environmental Affairs (DEDEA) will act as the commenting authority. An application for authorisation has been accepted by DEA under application reference number **12/12/20/2211**.

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 to assess if potential environmental impacts can be avoided, minimised or mitigated to acceptable levels. Comprehensive, independent environmental studies are required in accordance with the EIA Regulations to provide the competent authority with sufficient information in order to make an informed decision. Eskom Holdings Limited appointed Savannah Environmental (Pty) Ltd as the independent **Environmental Consultants** to conduct the EIA process for the proposed project.

An EIA is an effective planning and decision-making tool for the project developer as it allows for the identification and management of potential environmental impacts. It provides the opportunity for the developer to be forewarned of potential environmental issues, and allows for resolution of the issues reported on in the Scoping and EIA Reports as well as dialogue with **Interested and Affected Parties** (I&APs).

In terms of sections 24 and 24D of NEMA, as read with Government Notices R543 and R545, both Scoping and EIA processes are required as the proposed project includes the following "listed activities" in terms of GN R544; R545 and 546 (GG No 33306 of 18 June 2010).

Relevant Notice	Activity No	Description of listed activity	Applicability to the project
Government Notice R544, 18 June 2010	9	The construction of facilities or infrastructure exceeding 1000 metres in length for the bulk transportation of water, sewage or storm water – (i) with an internal diameter of 0,36 metres or more; or (ii) with a peak throughput of 120 litres per second or more	Ablution facilities and drinking water will be required at the site office for the operational staff.
Government Notice R544, 18 June 2010	10	The construction of facilities or infrastructure for the transmission and distribution of electricity –	A 400kV overhead power line will be used to connect the wind

Relevant Notice	Activity No	Description of listed activity	Applicability to the project
		(i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275kV;or (ii) inside urban areas or industrial complexes with a capacity of 275kV or more.	farm to the Droërivier substation. This activity is however the subject of a separate EIA process.
Government Notice R544, 18 June 2010	11	The construction of: (i) canals; (ii)channels; (iii) bridges; (iv) dams; (v) weirs; (vi) bulk stormwater outlet structures; (vii) marinas; (viii) jetties exceeding 50 square metres in size (ix) slipways exceeding 50 square metres in size (x) buildings exceeding 50 square metres in size; or (xi) infrastructure or structures covering 50 square metres or more Where such construction occurs within a watercourse or within 32 metres of a watercourse, measures from the edge of a watercourse, excluding where such construction will occur behind the development setback line.	Drainage lines may occur on site and may be affected by the proposed development. The applicability of this activity is to be confirmed at EIA stage.
GN 544, 18 June 2010	13	The construction of facilities or infrastructure for the storage, or for the storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of 80 but not exceeding 500 cubic metres.	The onsite storage of diesel and fuel in containers for construction machinery and vehicles. Applicability to be confirmed at EIA stage.
Government Notice R544, 18 June 2010	22	The construction of a road, outside urban areas, With a reserve wider than 13,5 metres, or Where no road reserve exists where the road is wider than 8 metres	External and internal access roads between turbines need to be constructed. Temporary roads during construction could be up to 13 m in width.

Relevant Notice	Activity No	Description of listed activity	Applicability to the project
Government Notice R545, 18 June 2010	1	The construction of facilities or infrastructure for the generation of electricity where the electricity output is 20 megawatts or more.	Eskom is proposing the establishment of a wind farm up to 200 MW.
Government Notice 545, 18 June 2010	3	The construction of facilities or infrastructure for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of more than 500 cubic meters.	The onsite storage of diesel and fuel in containers for construction machinery and vehicles. Applicability to be confirmed at EIA stage.
Government Notice R545, 18 June 2010	15	Physical alteration of undeveloped, vacant or derelict land for residential, retail, commercial, recreational, industrial or institutional use where the total area to be transformed is 20 hectares or more; except where such physical alteration takes place for (i) Linear development activities or (ii) Agriculture or afforestation where activity 16 in this schedule will apply.	The facility is proposed to be established within an area of ~8 198 ha in extent.
Government Notice GN 546, 18 June 2010	1	The construction of billboards exceeding 18 square metres in size outside urban or mining areas or outside industrial complexes. (vi) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans.	Applicability to be confirmed at EIA stage.
Government Notice R546, 18 June 2010	2	The construction of reservoirs for bulk water supply with a capacity of more than 250 cubic metres. (iii)(dd) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans.	Applicability to be confirmed at EIA stage.
Government Notice R546, 18 June 2010	4	The construction of a road wider than 4 metres with a reserve less than 13,5 metres (ii)(ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent	Applicability to be confirmed at EIA stage.

Relevant Notice	Activity No	Description of listed activity	Applicability to the project
		authority or in bioregional plans.	
Government Notice R546, 18 June 2010	10	The construction of facilities or infrastructure for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of 30 but not exceeding 80 cubic metres. (ii)(ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans.	Applicability to be confirmed at EIA stage.
Government Notice R546, 18 June 2010	12	The clearance of an area of 300 square metres or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation. (b) within critical biodiversity areas identified in bioregional plans.	Applicability to be confirmed at EIA stage.
Government Notice R546, 18 June 2010	13	The clearance of an area of 1 hectare or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation.	Applicability to be confirmed at EIA stage.

This report documents the scoping evaluation of the potential environmental impacts of the proposed construction and operation of the proposed Aberdeen 200 MW Wind Farm project. This scoping study forms part of the EIA process and was conducted in accordance with the requirements of the EIA Regulations in terms of Section 24(5) of the National Environmental Management Act (NEMA; Act No 107 of 1998).

1.5. Objectives of the Scoping Phase

The Scoping Phase of the EIA process refers to the process of identifying potential issues associated with the proposed project, and defining the extent of studies required within the EIA Phase. This is 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 includes both government authorities and interested and affected parties (I&APs).

In accordance with the EIA Regulations, the main purpose of the Scoping Phase is to focus the environmental assessment in order to ensure that only potentially significant issues, and reasonable and feasible alternatives are examined in the EIA Phase. The Draft Scoping Report provides stakeholders with an opportunity to verify that the issues they have raised through the public consultation process to date have been captured and adequately considered, and provides a further opportunity for additional key issues for consideration to be raised. The Final Scoping Report will incorporate all issues and responses raised during the public review of the Draft Scoping Report prior to submission to DEA.

1.6. Details of Environmental Assessment Practitioner and Expertise to conduct the Scoping and EIA

Savannah Environmental was contracted by Eskom Holdings Limited as an independent consultant to undertake an Environmental Impact Assessment (EIA) for the proposed project, as required by the NEMA EIA Regulations. Neither Savannah Environmental, nor any of the specialist sub-consultants on this project are subsidiaries of or affiliated to Eskom Holdings Limited. Furthermore, Savannah Environmental does not have any interests in secondary developments that may arise out of the authorisation of the proposed project.

Savannah Environmental is a specialist environmental consulting company providing a holistic environmental management service, including environmental assessment 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. 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 EAPs from Savannah Environmental who are responsible for this project are:

» Jo-Anne Thomas - a registered Professional Natural Scientist and holds a Master of Science degree. She has 14 years of consulting experience in the

environmental field. Her key focus is on strategic environmental assessment and advice; management and co-ordination of environmental projects, which includes integration of environmental studies and environmental processes into larger engineering-based projects and ensuring compliance to legislation and guidelines; compliance reporting; the identification of environmental management solutions and mitigation/risk minimising measures; and strategy and guideline development. She is currently responsible for the project management of EIAs for several renewable energy projects across the country.

» Alicia Govender – the principle author of this report, holds an Honours Bachelor of Science degree in Environmental Management and has 4 years' experience in environmental management. She is currently the responsible EAP for several renewable energy projects and other EIAs across the country.

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:

Specialist	Area of Expertise
David Hoare of David Hoare Consulting cc	Ecology, fauna and flora
Endangered Wildlife Trust	Avifauna
Werner Marais of Animalia zoological and ecological consultation	Bats
Johan van der Waals of Terrasoil Science	Geology, soils and agricultural potential
Lourens du Plessis of MetroGIS	Visual impacts and GIS mapping
Celeste Booth of the Albany Museum	Heritage / Archaeology
Morne de Jager of MENCO (M2 Environmental Connections cc)	Noise Impact
Tony Barbour of Tony Barbour Consulting and Research	Social Impact

Refer to Appendix A for the curricula vitae for Savannah Environmental and the specialist sub-consultants team.

STRATEGIC CONTEXT FOR ENERGY PLANNING CHAPTER 2

2.1. Strategic Electricity Planning in South Africa

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 hierarchy of policy and planning documentation that support the development of renewable energy projects such as wind energy facilities is illustrated in Figure 2.1. 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 development of the proposed wind energy facility.

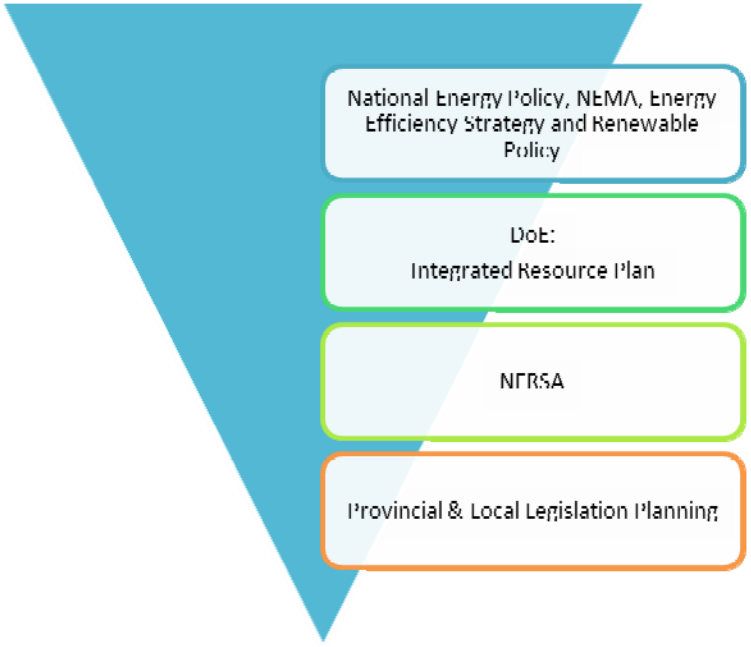


Figure 2.1: Hierarchy of electricity policy and planning documents

2.1.1. 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 DME in 1998. This White Paper identifies five key objectives for energy supply within South Africa, i.e.:

» increasing access to affordable energy services;
» improving energy sector governance;
» stimulating economic development;

» managing energy-related environmental impacts; and
» securing supply through diversity.

Furthermore, the National Energy Policy identifies the need to undertake an Integrated Energy Planning (IEP) process and the adoption of a National Integrated Resource Planning (NIRP) approach. Through these processes, the most likely future electricity demand based on long-term southern African economic scenarios can be forecasted, and provide the framework for South Africa (and Eskom) to investigate a whole range of supply and demand side options.

2.1.2. Renewable Energy Policy in South Africa

Internationally there is increasing development of the use of renewable technologies for the generation of electricity due to concerns such as climate change and exploitation of resources. In response, the South African government ratified the United Nations Framework Convention on Climate Change (UNFCCC) in August 1997 and acceded to the Kyoto Protocol, the enabling mechanism for the convention, in August 2002. In addition, national response strategies have been developed for both climate change and renewable energy.

Investment in renewable energy initiatives, such as the proposed wind energy facility, is supported by the National Energy Policy (DME, 1998). This policy recognises that renewable energy applications have specific characteristics which need to be considered. The Energy Policy is "*based on the understanding that renewables are energy sources in their own right, and are not limited to small-scale and remote applications, and have significant medium- and long-term commercial potential*." In addition, the National Energy Policy states that "*Renewable resources generally operate from an unlimited resource base and, as such, can increasingly contribute towards a long-term sustainable energy future*".

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. It also informs the public and the international community of the Government's vision, and how the Government intends to achieve these objectives; and informs Government agencies and organs of their roles in achieving the objectives.

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. In spite of this range of resources, the National Energy

Policy acknowledges that the development and implementation of renewable energy applications has been neglected in South Africa.

Government policy on renewable energy is therefore concerned with meeting the following challenges:

» Ensuring that economically feasible technologies and applications are implemented;
» Ensuring that an equitable level of national resources is invested in renewable technologies, given their potential and compared to investments in other energy supply options; and
» Addressing 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*."

In order to support the Government in meeting its target, Eskom is investigating and implementing potential renewable energy projects, which include a Concentrated Solar Thermal project in the Northern Cape, the Sere Wind Farm near Vredendal as well as several other wind energy facilities.

2.1.3. Final Integrated Resource Plan, 2010 - 2030

The Energy Act of 2008 obligates the Minister of Energy to develop and publish an integrated resource plan for energy. Therefore, the Department of Energy (DoE), together with the National Energy Regulator of South Africa (NERSA) has compiled the Integrated Resource Plan (IRP) for the period 2010 to 2030. The objective of the IRP is to develop a sustainable electricity investment strategy for generation capacity and transmission infrastructure for South Africa over the next twenty years. The IRP is intended to:

» Improve the long term reliability of electricity supply through meeting adequacy criteria over and above keeping pace with economic growth and development;

» Ascertain South Africa's capacity investment needs for the medium term business planning environment;
» Consider environmental and other externality impacts and the effect of renewable energy technologies; and
» Provide the framework for Ministerial determination of new generation capacity (inclusive of the required feasibility studies).

The objective of the IRP is to evaluate the security of supply, and determine the least-cost supply option by considering various demand side management and supply-side options. The IRP also aims to provide information on the opportunities for investment into new power generating projects.

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 updated on 29 January 2010. The Department of Energy released the Final IRP in March 2011, which was accepted by Parliament at the end of March 2011. This Policy-Adjusted IRP is recommended for adoption by Cabinet and subsequent promulgation as the final IRP. In addition to all existing and committed power plants (including 10 GW committed coal), the plan includes 9.6 GW of nuclear; 6.3 GW of coal; 17.8 GW of renewables (including 8,4GW solar); and 8.9 GW of other generation sources.

2.2. Eskom's Climate Change and Renewable Energy Strategies

Eskom's core business is in the generation and transmission (transport) of electricity. Eskom is responsible for the provision of electricity to their customers, and currently generates approximately 95% of the electricity used in the country. Therefore the reliable provision of electricity by Eskom is critical for industrial development and related employment in the region and therefore a contributing factor to the overall challenge of poverty alleviation and sustainable development in South Africa. Electricity, by nature, cannot be stored and therefore must be used as it is generated. Therefore, electricity is generated in accordance with supply-demand requirements, and must be efficiently transmitted from the point of generation to the end-user.

If Eskom is to meet its mandate and commitment to supply the ever-increasing needs of end-users, it has to plan, establish and expand its infrastructure of generation capacity and transmission power lines on an on-going basis. With current energy and electricity demands within the country projected to continue increasing, new investments in electricity generation and transmission capacity are required. Eskom is currently expanding its electricity generation, transmission and distribution capacity through the construction of additional

power stations and power lines and associated infrastructure. In addition to these, other clean electricity generation projects are being investigated. Since the capacity expansion programme started in 2005, an additional 4453.5 MW has already been commissioned. The plan is to deliver an additional 16 304MW in power station capacity by 2017. Ultimately Eskom will double its capacity to 80 000MW by 2026 (www.eskom.co.za). In line with Government's targets for renewable energy, Eskom plans to include at least 1600MW of renewable energy (wind and solar) within the electricity generation mix (*extract from Eskom's Climate Change Commitment - The 6 Point Plan*).

Eskom has developed a renewable energy strategy which outlines a number of focus areas, including research, demonstration and development opportunities. The establishment of a wind energy facility as a potential to qualify as a CDM (Clean Development Mechanism) project is based on the United Nation Framework Convention on Climate Change (UNFCCC) requirements. The proposed wind energy facility has a potential to avoid air emissions (including CO_2, SO_X, NO_X), water demand and waste generation (in the form of ash) compared to what will occur without the introduction of renewable energy technology, which would arise from coal-fired power generation.

In addition, Eskom has developed a Climate Change Strategy in order to contribute to global efforts to combat climate change while ensuring the sustainability of the economy, environment and society. This strategy supports investment in renewable energy technologies as part of the power generation mix for the country. Eskom's Climate Change Strategy unpacks its commitment to climate change challenge in 6 key focal areas:

1. ***Diversification*** of the generation mix to lower carbon emitting technologies
2. ***Energy efficiency*** measures to reduce demand and greenhouse gas and other emissions
3. ***Adaptation*** to the negative impacts of climate change
4. ***Innovation*** through research, demonstration and development
5. ***Investment*** through carbon market mechanisms
6. ***Progress*** through advocacy, partnerships and collaboration

Renewable energy technologies which have been evaluated (and still being investigated) by Eskom include wind, solar, wave, tidal, ocean current, biomass and hydro. Through the South African Bulk Renewable Energy Generation (SABRE-Gen) programme, a vehicle was established to enable the evaluation of multi-MW, grid connected generation. The initiatives all follow the same functional structure: namely the identification of promising options, an assessment of the financial and economic viability as well as resource potential in the country, the implementation of demonstration projects to conduct operational

research, and the provision of strategies for the uptake and sustainable deployment of the technologies where feasible.

Eskom commissioned the Klipheuwel Wind Energy Demonstration Facility (north of Durbanville) in February 2003. Research at this facility has focused on how available wind energy technologies interact with the South African environment and has highlighted unique factors that can impact performance. Key findings from the demonstration facility informed the decision for Eskom to pursue wind projects in the country.

2.3. Provincial and Local Level Developmental Policy

2.3.1. Eastern Cape Provincial Growth and Development Programme

The Eastern Cape Provincial Growth and Development Programme (PGDP) 2004-2014 sets out the vision and plan for development for the Eastern Cape until 2014. It highlights, in particular, strategies to fight poverty, promote economic and social development, and create jobs.

The strategy document does not highlight any specific measures to promote the development of renewable energy sources. However, an analysis of energy sources within the province reveals that 23% of the population of the province still rely on paraffin for their energy needs while 25% rely on candles for lighting.

Energy demands and electricity infrastructure rollout forms part of the Strategic Infrastructure Programme of the PGDP. The PGDP states that the, "…economic and logistics infrastructure - energy, roads, rail, ports, and air transport among others - is a necessary condition for economic growth and development."

Section 5 of the PGDP (2004-2014) identifies six strategic objective areas of the PGDP. Of these the infrastructure programme is of relevance to the study. The report notes that development of infrastructure, especially in the former homelands, is a necessary condition to eradicate poverty through:

» The elimination of social backlogs in access roads, schools and clinics and water and sanitation;
» To leverage economic growth through access roads and improving the road, rail and air networks of the Province.

Infrastructure development, in turn, will have strong growth promotion effects on the agriculture, manufacturing and tourism sectors by improving market access and by "crowding in" private investment. Poverty alleviation should also be promoted through labour-intensive and community based construction methods.

The PGDP indicates that the programmes have been selected for their potential in leveraging significant resources, creating a large multiplier effect, and providing a foundation for accelerated economic growth. Of specific relevance is the Strategic Infrastructure Programme. This programme indicates that enabling economic and logistics infrastructure - energy, roads, rail, ports, and air transport among others - is a necessary condition for economic growth and development. Specific reference is therefore made to energy infrastructure.

The Strategic Infrastructure Programme also seeks to consolidate and build on this coastal advantage through the provision of world-class infrastructure and logistics capability at the Coega and East London IDZs, and improving connectivity and linkages with major industrial centres, such as Johannesburg.

The high-level objectives of the Strategic Infrastructure Programme include consolidating and building upon the strengths of the Province's globally-competitive industrial sector through the development of world-class infrastructure and logistics capability in the East London and Coega IDZs. A reliable energy supply will be critical to achieving these objectives. The proposed wind farm will contribute to the future energy requirements of the Eastern Cape, and its proximity (270 km) to the Coega IDZ will also benefit these key initiatives.

2.3.2. Cacadu District Municipality Integrated Development Plan

The Cacadu District Municipality (CDM) Integrated Development Plan (IDP) (2007-2012) refers to the Medium Term Strategic Framework (MTSF) developed in July 2009 by the Minister of Planning. The aim of the MTSF is to guide planning and resource allocation across all the spheres of government through the identification of ten (10) National Strategic Medium Term Priorities. National, Provincial and Local spheres of government are expected to adapt their planning in line with the Strategic Priorities. The Strategic Priorities that are relevant to the proposed Aberdeen wind farm include:

» Speeding up growth and transforming the economy to create decent work and sustainable livelihoods:
» Strengthen the skills and human resource base:
» Sustainable Resource Management and Use:

The sustainable resource management and use is a specifically relevant priority as is makes reference to impact of climate change and South Africa's ratification of the United Nations Framework on Climate Change in August 1997 and the Kyoto Protocol in March 2002. The main objective of government in terms of this priority is to encourage sustainable resource management and use by focusing on various interventions including the pursuance of renewable energy alternatives and promotion of energy efficiency.

With regard to the CDM not all of the 10 Strategic Priorities are relevant to the role and mandate of the CDM. However, the IDP indicates that seven components of the MTSF have been extracted in the interest of influencing project formulation and resource allocation. Of these the following are relevant to the proposed Aberdeen wind farm:

» Identification of Economic Opportunities, specifically efforts to identify and enhance existing economic opportunities, and create employment opportunities;
» Enhancement of Skills and Education Systems, specifically implementation of skills development programmes and initiatives:
» Sustainable Resource Management and Use, specifically the investigation of renewable energy alternatives. This priority also highlights the importance of enhanced biodiversity and the preservation of natural habitats.

The CDM IDP therefore specifically makes reference to the need to investigate renewable energy options, such as wind energy. However, the IDP also highlights the importance of tourism to the local economy. The potential impact of the proposed Aberdeen wind farm on tourism will be assessed during the assessment phase of the EIA.

2.3.3. District Municipality Guidelines and Policies

The Cacadu District Municipality is currently in the process of working towards the development of a guiding document for the province, to be entitled 'Towards Positioning the Eastern Cape as the Epicentre of Renewable Energy in South Africa'. This is being facilitated through Renewable Energy working group workshops which aims at encouraging dialogue between major role-players to ensure that the region takes full advantage of the opportunities in the renewable energy sector. At this stage, three focus areas have been identified:

1. Renewable Energy component manufacturing
2. Regulatory environment
3. Research, development and training

As part of the Regulatory environment, the municipality is intending to develop an efficient enabling system for renewable energy decisions. This will include a provincial strategic environmental assessment and municipal mechanisms to ensure appropriate zoning of renewable energy facilities and to provide infrastructural and other support.

As part of the initiative to plan for renewable energy, the Cacadu District Municipality is currently developing a Land Use and Locational Policy for

Renewable Energy Projects. This policy is intended to be a tool and guideline to assist Local Authorities in decision-making as a point of departure for land use applications in the Cacadu District.

2.3.4. Camdeboo Local Municipality Integrated Development Plan

The Vision Statement for the Camdeboo Integrated Development Plan 2007 -2012 states that:

"*Camdeboo Municipality strives to ensure the socio-economic development and effective participation of all its inhabitants within an economically viable and sustainable environment, where equal opportunities are promoted. Poverty is eradicated and services provided at an affordable cost within a crime free, healthy environment and well managed administration*".

This long-term Vision is linked to development Priorities, Objectives, Strategies and Projects which are listed in the IDP. The key Development Priorities identified during the participation process are, in order of importance:

» Housing (RDP backlog as well as fallen);
» Infrastructure (including services, maintenance and bulk supply);
» Local Economic Development (including, job creation, Black Economic Empowerment (BEE), skills development, tourism, industrial development, heritage, etc.);
» Institution building (including Staff);
» Community building (including community facilities, recreation, HIV/AIDS)

The key development priority of relevance to the proposed Eskom Aberdeen WEF is Local Economic Development (LED). In this regard the IDP notes that the CLM must promote LED by creating an enabling environment through investing in good infrastructure (new as well as maintaining and upgrading the old), ensuring that a high standard of services (water, electricity, health care, etc.) is rendered to all areas and that sufficient land is allocated for enterprise and industrial development. One of the key constraints affecting the economic development of the area that is relevant to the project is the shortage of skills and low education levels.

The IDP also lists the findings of a Community Needs Analysis. In terms of priorities, the key priorities that are relevant to the proposed wind farm include job creation, BEE, small enterprise, industrial and sector development (e.g. Tourism and & Agriculture) and skills development. The proposed Aberdeen wind farm has the potential to contribute towards the creation of jobs, skills development and the promotion of small businesses and BBE. However, due to

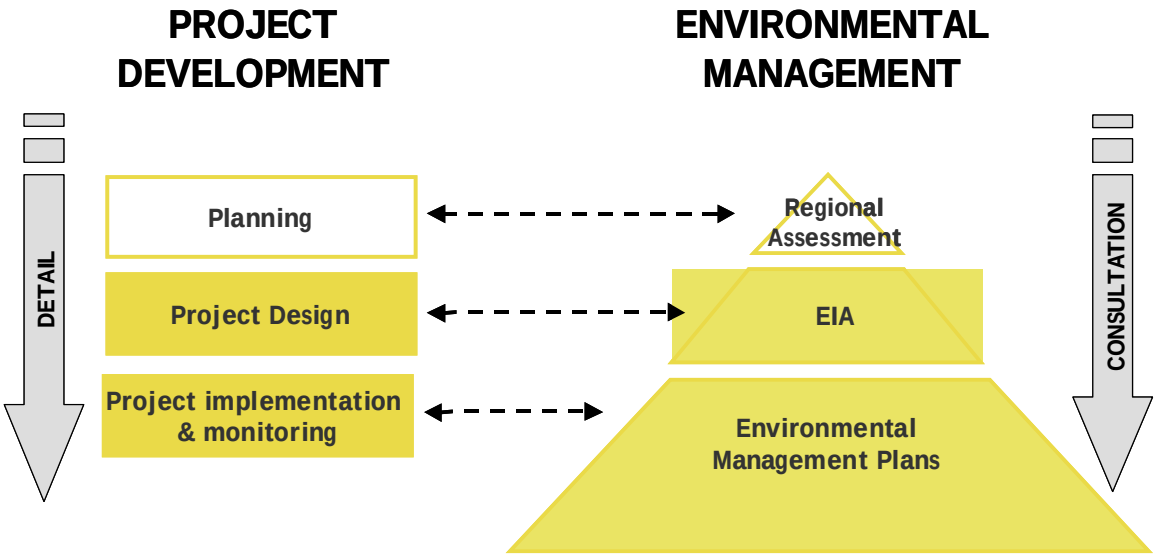
the visual impacts associated with large wind farms, the proposed development also has the potential to impact negatively on the tourism potential of the area. These issues will be assessed during the assessment phase of the EIA.

2.2. Project Planning and the site-specific Environmental Impact Assessment

Eskom Generation's planning process is based on anticipated electricity demand, rather than immediate load requirements in order to timeously supply the anticipated increased demand in the country. This is due to the long lead-time process of acquiring the necessary permissions to construct such infrastructure from DEA and the National Energy Regulator of South Africa (NERSA), and negotiations with landowners, and power generation infrastructure purchase, delivery and ultimately construction.

In terms of the EIA Regulations under NEMA, a Scoping and EIA report (including an environmental management programme (EMP)) are required to be compiled for this proposed project. The EIA is considered as an effective planning and decision-making tool in the planning process of a new facility, a power generation facility in this case. It allows potential environmental consequences resulting from a technical facility during its establishment and its operation to be identified and appropriately managed through project design and implementation. The level of detail at a site-specific level is refined through the process, and allows for resolution of potential issue(s) through dialogue with affected parties.

The relationship between project development and the environmental assessment and management process is depicted in the figure below.



The project planning process for the Aberdeen Wind Farm has included a detailed site selection process which was confirmed for environmental suitability by

Savannah Environmental through a Regional Assessment process. This site selection process is detailed in Chapter 4 of this Scoping Report.

WIND ENERGY AS A POWER GENERATION OPTION CHAPTER 3

Wind energy is firmly established as a mature technology for electricity generation, with a reported 194.4 GW installed base worldwide (reported by the Global Wind Energy Association (GWEC), December 2010). It is one of the fastest growing electricity generating technologies with installed capacity increasing by ~10 000 MW annually, 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. 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. The proposed wind energy facility has great potential to reduce harmful greenhouse gases and other particulate emissions (including CO_2, SO_X, NO_X), water demand and waste generation (in the form of ash) compared to what will occur without the introduction of renewable energy technology.

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 'priceless' 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.

3.1. Investigations into Wind Energy for South Africa

In February 2003, Eskom commissioned the Klipheuwel Wind Energy Demonstration Facility north of Durbanville in the Western Cape. Research at this facility has focused on how the technology interacts with the South African environment and has highlighted unique factors that can impact performance. The research information collected ranges from production statistics, daily operational requirements, detailed condition monitoring and national resource understanding and analysis.

The demonstration facility has been a major success and results of the research has provided Eskom with valuable technical and strategic information pertaining to utilising wind as a source of energy, and has provided guidance with regards to the establishment of a large scale commercial facility.

Figure 3.1: Photograph of the existing three turbines at the Klipheuwel Demonstration Facility, north of Durbanville

As a part of Eskom's wind research programme, a national wind atlas for South Africa was compiled (in conjunction with the DoE and the CSIR for the South African Renewable Resource Database wind atlas project which is currently being developed). Areas of high potential for future commercial wind farm development were identified, and high-accuracy meteorological measurement stations are to be erected at these sites for wind monitoring.

Based on the lessons learnt from the Klipheuwel pilot demonstration facility as well as the analyses on Eskom's measured wind data, Eskom have determined that a full-scale commercial wind energy facility can successfully be established in South Africa. The construction of such a commercial facility is now being proposed on a site to the west of Aberdeen in the Eastern Cape (refer to Chapter 4 for more details on the siting of this facility).

3.2. The Importance of the Wind Resource for Energy Generation

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 farm (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 also 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.

When considering recorded annual energy utilisation factors for wind energy facilities internationally, it is evident that the performance of a South African facility would be in line with international trends (refer Table 3.1 below).

Table 3.1: Record of Annual Energy Utilisation Factors

Location	Average Capacity Factor
UK	29%
Rural Germany	16%
Denmark	24%
Klipheuwel Demonstration facility – South Africa	16%*

*Actual Performance over a period of 3 years

In comparison, actual wind measurements (over a period of 3 years) at the proposed site applied to typical wind turbine performance has indicated that a wind energy facility on the West Coast would perform as well as international

facilities, with an energy utilisation factor of 26%. Climatic variation may impact this production figure by as much as 30% on a year-on-year basis (both negative and positive).

The wind speed measured at a meteorological station is also affected by the local topography (extending to a few tens of kilometres from the station) or surface roughness. 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 also has to be taken into account in the placement of turbines.

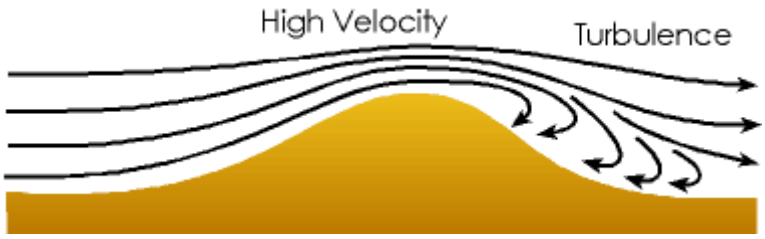


Figure 3.3: Illustration of the effect of relief on air flow

A wind resource measurement and analysis programme must be conducted for the site proposed for development, as only measured data will provide a robust prediction of the facility's expected energy production over its lifetime.

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

» Predominant wind direction, wind strength and frequency
» Distance from coast, where wind moving over the land mass results in a loss of wind energy (and ultimately a loss in production)
» Topographical features or relief affecting the flow of the wind (e.g. causing shading effects and turbulence of air flow)
» 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 3 MW capacity turbine whose rotors are up to 140 m in diameter, each turbine would be separated by approximately 280 m to 420 m. The erection of turbines in parallel rows one behind another would require a distance between rows of 700 m to 980 m. Once a viable footprint for the establishment of the wind energy facility has been determined (through the consideration of both technical and environmental criteria), the micro-siting of the

turbines on the site will be determined using industry standard software systems, which will automatically consider the spacing requirements.

3.3. What is a Wind Turbine and How Does It Work

The kinetic energy of wind is used to turn a wind turbine to generate electricity. A wind turbine typically 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 Aberdeen Wind Farm will have a hub height of ~140 m, and a rotor diameter of ~140 m (i.e. each blade will be up to 65 m in length with hub having diameter of up to 10m). These turbines would be capable of generating in the order of between 1.5 - 3 MW each (in optimal wind conditions).

3.3.1. Main Components of a Wind Turbine

The turbine consists of the following major components:
» The tower
» The rotor
» The nacelle
» The foundation

The tower
The tower, which supports the rotor, is constructed from tubular steel. It is approximately 90 -140 m tall in height. 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.

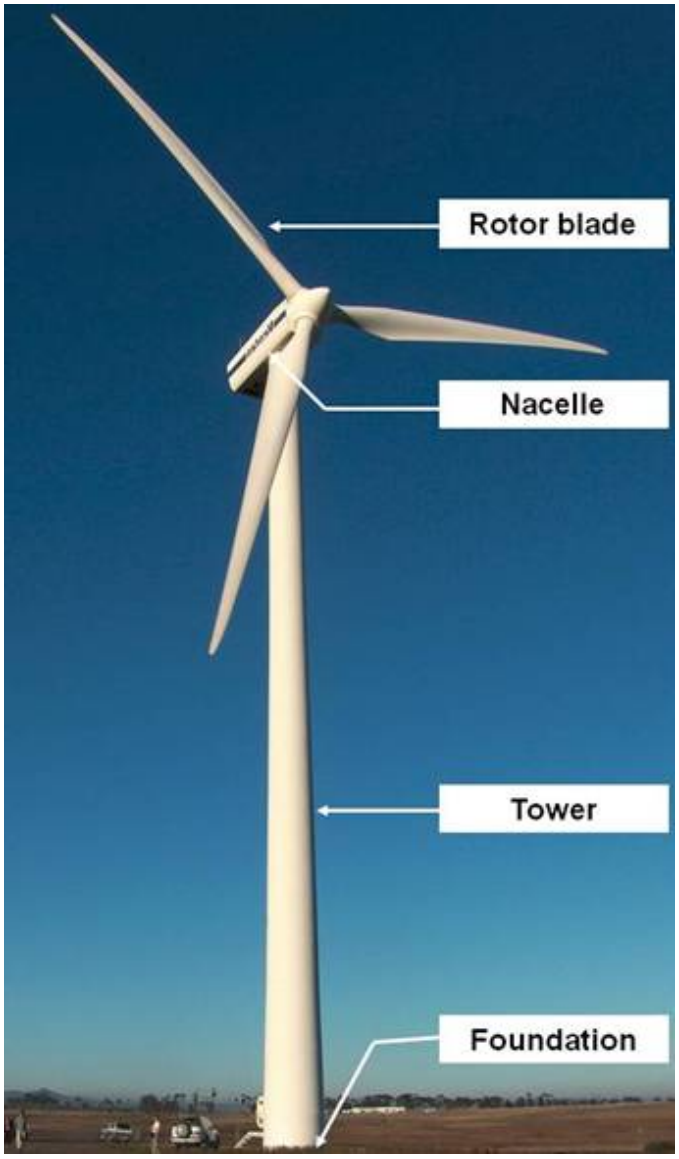


Figure 3.4: Illustration of the main components of a wind turbine

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's Law). 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.

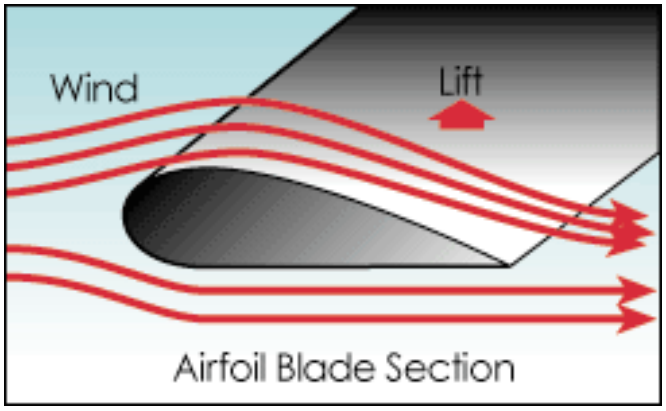


Figure 3.5: Illustration of the principle of lift

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.

The nacelle

The nacelle contains the generator, control equipment, gearbox and anemometer for monitoring the wind speed and direction (as shown in Figure 3.6).

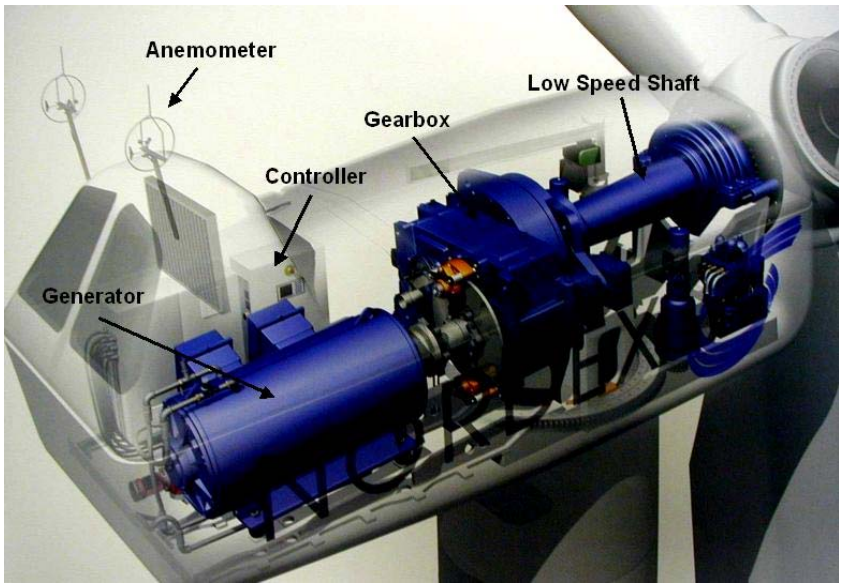


Figure 3.6: Detailed structure of a nacelle of a horizontal axis turbine

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 foundation

The foundation is used to secure each wind turbine to the ground. These structures are commonly made of concrete and are designed for vertical loads (weight) and lateral loads (wind).

3.3.2. 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 farm 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.

3.3.3. Understanding the 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 turbine's rotor is approximately 59%. This value is known as the Betz Limit. If the blades were 100% efficient, a wind turbine would not work because the air, having given up all its energy, would entirely stop. 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).

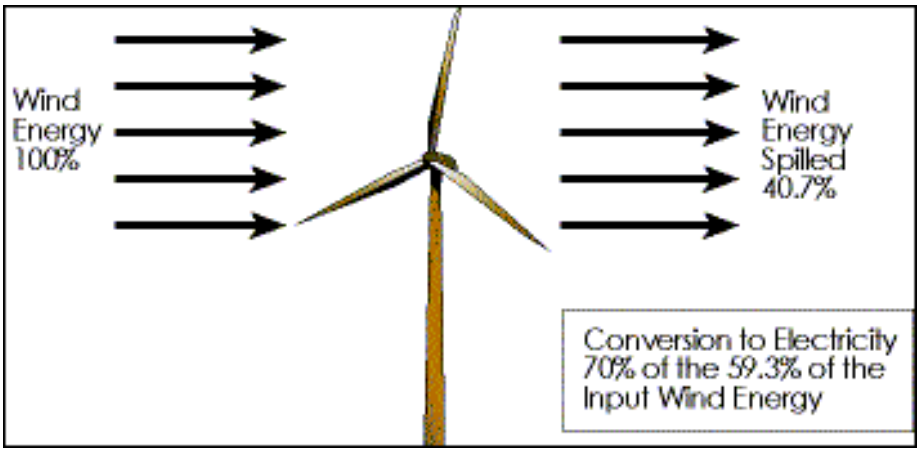


Figure 3.7: Illustration of the principle of the Betz Limit

DETERMINATION OF ACCEPTABLE SITES FOR THE DEVELOPMENT OF A WIND ENERGY FACILITY CHAPTER 4

Eskom commissioned the Klipheuwel Wind Energy Demonstration Facility, north of Durbanville, as a research facility in February 2003. As discussed in Chapter 3, the demonstration facility has provided Eskom with valuable research results pertaining to the utilisation of wind as a source of energy in South Africa, and has provided guidance with regards to the establishment of a large-scale commercial facility.

4.1. Identification of the West Coast Area for further Investigation

The goal set by Eskom in terms of wind energy development is for the construction of an additional 500MW over and above the 200MW recently authorised at the Skaapvlei site on the West Coast.

As an initial step in determining areas for development of additional wind energy facilities, Eskom identified five broad geographic regions at a strategic level for investigation and the identification of specific sites for further investigation. A site identification and selection process to determine sites suitable for wind energy development was undertaken by Eskom and the EIA consulting team during the period 2009 to 2010. This site selection process was based on the methodology developed and recommended by the Western Cape Department of Environmental Affairs and Development Planning (DEA&DP) within their guideline document entitled *Strategic Initiative to Introduce Commercial Land Based Wind Energy Development to the Western Cape - Towards a Regional Methodology for Wind Energy Site Selection* (Western Cape Provincial Government, May 2006). The sites identified through this process were then considered by Eskom in terms of technical criteria (including aspects such as ease /feasibility of grid connection, site access and [4]land availability). Following this, two sites were identified, based on Regional Assessment undertaken (March 2010), for further investigation for the establishment of wind energy facilities, i.e. the proposed Aberdeen Wind Farm on a site near Aberdeen in the Eastern Cape Province (the subject of this report) and the proposed Kleinzee 300MW Wind Farm south of Kleinsee on the West Coast of the Northern Cape (assessed within a separate EIA process).

A wind resource measurement and analysis programme must be conducted for the sites proposed for development, as only measured data will provide a robust prediction of the facility's expected energy production over its lifetime. The importance of the wind resource for energy generation is also discussed in

[4] Amount of land available for development

Chapter 3. As such, Eskom are in the process of erecting a wind monitoring station at these identified sites.

This chapter provides the outcomes of the regional assessment and technical considerations specific to the study area west of Aberdeen, and provides results which indicate the suitability of specific area/s for wind energy siting and development. A separate EIA process is being undertaken to assess the potential impacts that may result from the Kleinzee 300MW Wind Farm in the Northern Cape (DEA Ref no. 12/12/20/2212)[5].

4.2. Methodology in Determining Areas Considered Acceptable for the Development of a Wind Energy Facility within the Identified Study Area

The regional assessment study undertaken was based on the guidelines and findings of the Proposed Regional Methodology (Report 5) of the Western Cape Provincial Government guideline document for wind energy development (Western Cape Provincial Government, May 2006). The methodology proposed within this guideline document is intended to be a **regional level planning tool** to guide planners and decision-makers with regards to appropriate areas for wind energy development (on the basis of planning, environmental, infrastructural and landscape parameters). The area identified as suitable through this study would then be considered at a **site-specific level** through an environmental impact assessment. The use of this methodology to identify a potential site for development is supported by the competent authority for the project (i.e. Department of Environmental Affairs, DEA).

In summary, the Regional Methodology guideline includes methods for the assessment and delineation of areas appropriate for wind energy development, including the use of appropriate 'negative' and 'positive' buffer zones (suitable to the South African context) to build in cumulative impact concerns, and the incorporation of landscape issues relating to landscape character, value, sensitivity and capacity. The approach and methodology followed for this assessment within the study area are detailed below.

It is important to note that the Provincial guideline document focuses on environmental and planning issues in determining potentially acceptable sites for development. The consideration of technical factors, such as the availability of wind resources[6], proximity to the electricity grid, and site access requirements is considered important, as the technical drivers (and ultimately the technical viability of the project) are critical. Without considering this technical input, the areas identified through following the Regional Methodology are recognised as

[5] The draft Scoping report for this project is currently available for public review

[6] Discussed further in Chapter 3

areas appropriate for development, and not specifically for development of a Wind Farm. Therefore, these technical considerations were considered by Eskom for this study area in parallel with the regional assessment.

In undertaking the Regional Assessment, three main steps were followed.

4.2.1. STEP 1: Review of the Methodology proposed by DEA&DP's guideline document

The proposed methodology, as set out by the Western Cape Provincial Government document: *Strategic Initiative to Introduce Commercial Land Based Wind Energy Development to the Western Cape* is a regional planning tool for the determination of acceptable areas of suitability for wind energy development (on the basis of planning, environmental, infrastructural and landscape parameters). This methodology was revisited to ensure an understanding of the requirements for following the methodology. Consideration was given to the type of data required, the approach to be followed, and the criteria/parameters which may be required to be tailored for the area under investigation.

The vision of the strategic initiative is to develop and establish a policy on the implementation of a methodology to be used for the identification of areas suitable for the establishment of wind energy development, and is supported by the following objectives:

» To facilitate the practical implementation of wind energy generation technology in a manner that meets the principles of the White Paper on Energy Policy for South Africa.
» To introduce wind energy developments in a coordinated and sustainable manner (this guideline methodology is accepted by national DEA as an appropriate site identification tool and as such can be applied countrywide).
» To encourage responsible and rational wind energy developments which are beneficial to the community at large.
» To discourage investment of time and money in sites which could potentially be unsuitable from an environmental and planning perspective.
» To increase support for and interest in alternative renewable energy sources.
» To provide policy guidance in terms of the environmental impact assessment process.

4.2.2. STEP 2: Undertaking the Regional Assessments, based on the Regional Methodology proposed by DEA&DP's guideline document

As previously indicated, the regional assessment undertaken was based on the methodology outlined in Report 5 of the DEA&DP guideline: *Proposed Regional Methodology*. As thresholds developed to address environmental concerns vary

significantly between localities due to varying geographical, biophysical and cultural characteristics (including salient natural features, land uses and demography), degree of landscape modification, approaches to forward planning etc., those proposed within the methodology were revisited. As a result, the thresholds used within this regional assessment included some variation, omissions and additions to the specific methodology provided within the DEA&DP guideline, with a rationale for each variation provided (refer to Section 4.3). This is primarily due to the differing nature of the DEA&DP study area and the study areas proposed by Eskom.

4.2.3. STEP 3: Consideration of technical criteria

The results from the two steps above were considered by Eskom (the developer) together with issues of a technical nature to determine whether a wind energy facility can be sited in a particular area. The technical considerations included, *inter alia*:

» Wind potential and wind resources
» Relevance of topography on wind resources
» Specialist input
» Access to the electricity transmission and distribution grid
» Land availability
» Accessibility to the area
» Financial feasibility
» Regulatory requirements

These factors are not specifically addressed through the Regional Methodology assessment. The technical considerations were integrated with the regional assessment findings, and the final physical sites for investigation in the EIA phase were identified and defined. The technical factors/criteria are discussed in further detail in Section 4.4 of this report.

4.3. Approach in Determining Areas Considered Acceptable for the Development of a Wind Energy Facility within the Identified Study Area

4.3.1. Input Data Layers

The regional assessment has, as its basis, the following broad input components:

» Regional Methodology: based on Geographic Information System composite map data layers (both criteria-based and subjective)
» Elements of a **Criteria Based Assessment**: including environmental, planning and infrastructure criteria.

» Elements of a **Landscape Based Assessment**: incorporating character analysis, sensitivity, value and capacity considerations.

Data layers were sourced for both the Criteria Based Assessment and the Landscape Character Assessment for each area under investigation. This was undertaken in accordance with the data layers utilised for the DEA&DP study. The thresholds prescribed by this document were adhered to in most cases, unless otherwise specified - in which case a motivation/rationale for the deviation is stated.

The input components resulted in various layers of information, which were merged using Geographical Information Systems (GIS) to form a combined dataset (based on a rating system related to criteria importance or landscape sensitivity) which defined **preferred areas/zones for development** based on environmental and planning criteria.

Table 3.1 outlines the basic information used in the GIS mapping assessment.

Table 3.1: Information used in the GIS Mapping

Name	Note	Source	Scale
Layer 1			
Wetlands	The National Wetland Map (Version II)	DWA	1:50 000
Ramsar sites		DEA	1:50 000
Rivers		DWA	1:250 000
National Parks and Viewshed Protection Zones		SANParks	1:50 000
Mountain Catchments	MCA_boundaries	Nature Conservation Board	1:50 000
Provincial Nature Reserves	NPAs_beta_v1_2007	SANBI	1:50 000
Private Nature Reserves		Nature Conservation Board	1:50 000
Conservancies		Nature Conservation Board	1:50 000
Biosphere Reserves		Nature Conservation Board	1:50 000
World Heritage Sites		DEA	1:50 000
Important Bird Areas	Received from EWT	Birdlife SA (suspected original source)	1:50 000
Layer 2			
Mountains, ridges and hills	Captured from a detailed digital terrain model	MetroGIS	1:50 000

Name	Note	Source	Scale
	(20m contour interval)		
Layer 3			
Residential & mining/ industrial areas	National Land Cover 2000	CSIR/ARC	1:50 000
Layer 4			
Coastal buffer	Generated	MetroGIS	1:50 000
Layer 5			
Local/major airports		Surveyor General	1:50 000
Telecommunication towers		CAA	1:50 000
Layer 6			
Transmission/ distribution lines		Eskom	1:50 000
Railway lines		Surveyor General	1:50 000
Layer 7			
Roads		Surveyor General	1:50 000
Layer 8 (a, b and c)			
Landscape based assessment	Derived from analyses and overlays	MetroGIS	1:50 000
Composite			
Preferred areas for development	Composite of all criteria	MetroGIS	1:50 000

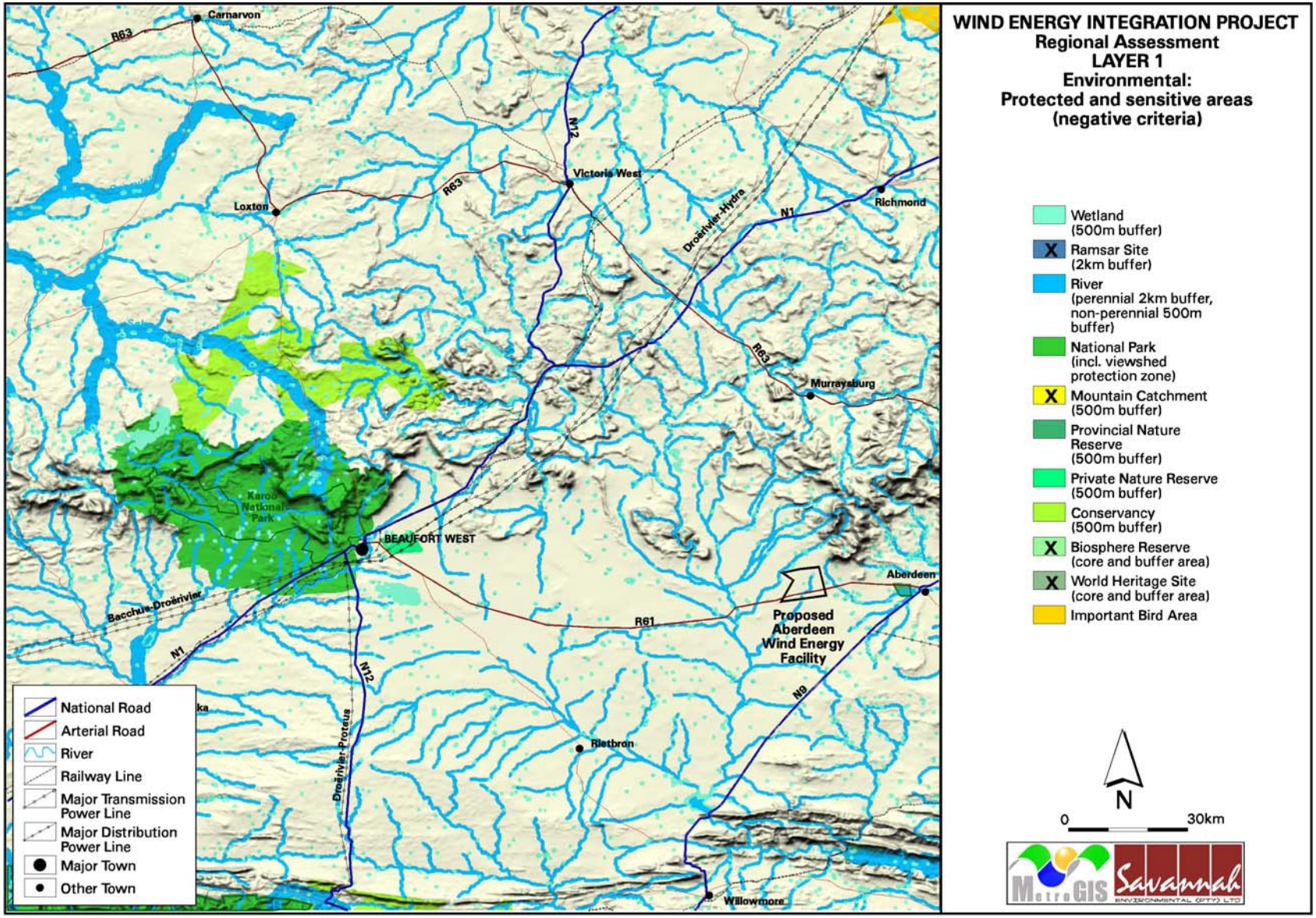
All the datasets were generated and mapped by MetroGIS. (Refer to Layers 1 - 8 and Figure 4.1 for the resulting mapped data).

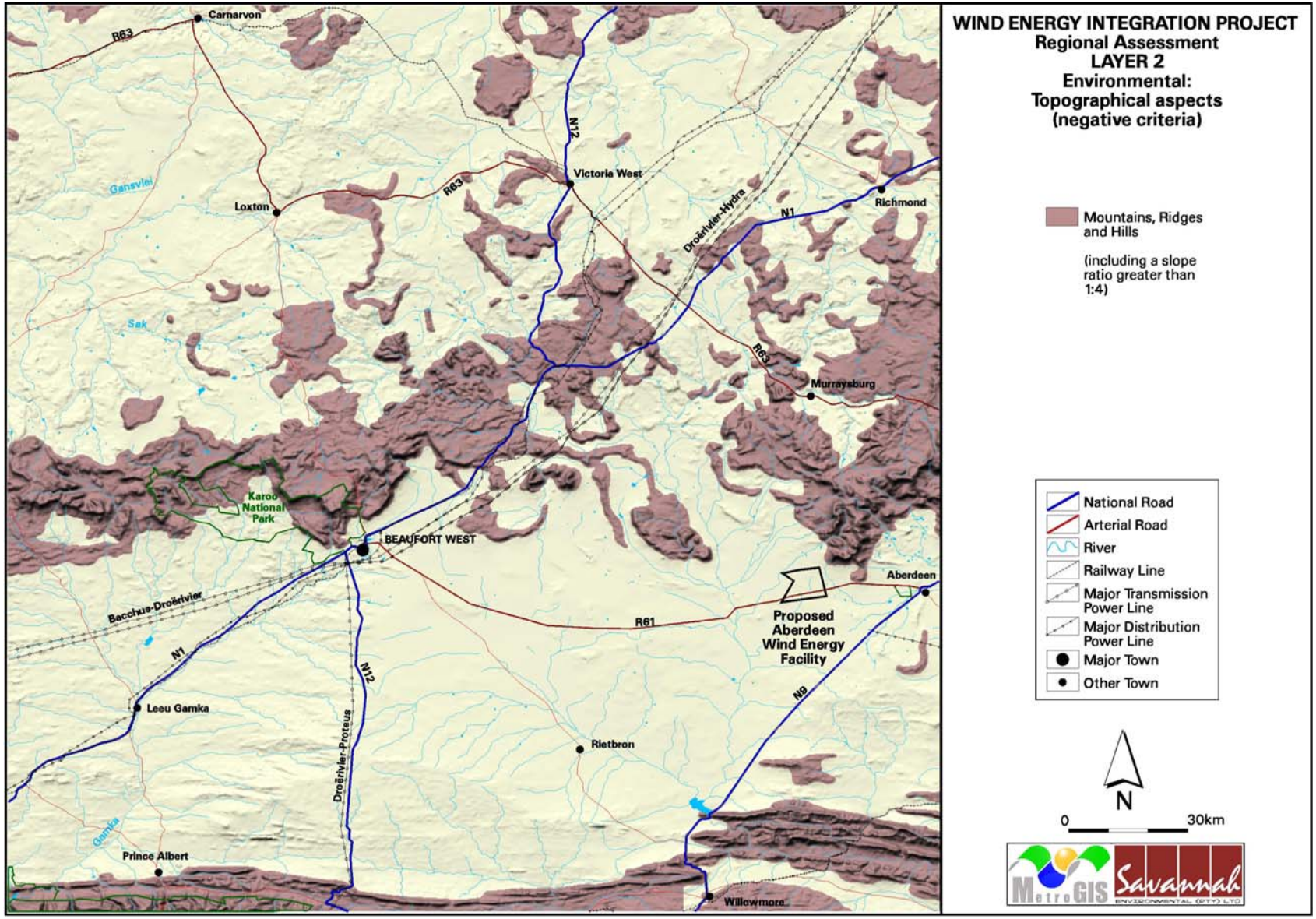
4.3.2. Results of the Regional Assessment

The following maps provide the results of the Regional Assessment undertaken for the Aberdeen area. This point is indicative of the position of the site identified through the Regional Assessment area and is included on the maps for reference and orientation purposes only. This point is not meant to indicate the actual site under investigation but rather just provides an indication of the area of investigation in the Regional Assessment phase of the process.

Criteria Based Assessment Data Layers

The maps which follow indicate the environmental and planning criteria considered within the Regional Assessment.


WIND ENERGY INTEGRATION PROJECT
Regional Assessment
LAYER 1
Environmental:
Protected and sensitive areas
(negative criteria)
Wetland (500m buffer)
Ramsar Site (2km buffer)
River (perennial 2km buffer, non-perennial 500m buffer)
National Park (incl. viewshed protection zone)
Mountain Catchment (500m buffer)
Provincial Nature Reserve (500m buffer)
Private Nature Reserve (500m buffer)
Conservancy (500m buffer)
Biosphere Reserve (core and buffer area)
World Heritage Site (core and buffer area)
Important Bird Area
National Road
Arterial Road
River
Railway Line
Major Transmission Power Line
Major Distribution Power Line
Major Town
Other Town
Carnarvon
Loxton
Victoria West
Richmond
Murraysburg
Aberdeen
BEAUFORT WEST
Karoo National Park
Rietbron
Willowmore
Proposed Aberdeen Wind Energy Facility
R63
N12
N1
R61
N9
Droërivier Hydro
Bacchus-Droërivier
Droërivier-Proteus
N
0
30km
MetroGIS
Savannah
ENVIRONMENTAL (PTY) LTD


WIND ENERGY INTEGRATION PROJECT
Regional Assessment
LAYER 2
Environmental:
Topographical aspects
(negative criteria)
Mountains, Ridges and Hills
(including a slope ratio greater than 1:4)
National Road
Arterial Road
River
Railway Line
Major Transmission Power Line
Major Distribution Power Line
Major Town
Other Town
N
0
30km
Carnarvon
Loxton
Victoria West
Richmond
Murraysburg
Aberdeen
BEAUFORT WEST
Karoo National Park
Proposed Aberdeen Wind Energy Facility
Leeu Gamka
Rietbron
Prince Albert
Willowmore
Bacchus-Droërivier
Droërivier-Hydra
Droërivier-Proteus
Gansvlei
Sak
Gamka
R63
N12
N1
R61
N9

Environmental Criteria

» *Protected and Sensitive Areas (Layer1*)

The information contained in **Layer 1** is focused on Environmental Criteria that would be negatively affected by the development of a wind energy facility (i.e. negative constraints to wind energy development). These include protected and environmentally sensitive areas within the study area including biosphere reserves, conservancies and nature reserves. All these categories are mapped as negative criteria for the development of a wind energy facility and have separate buffer zones. The buffers are used to define exclusionary zones around these protected and sensitive areas. A 2 km buffer around major wetlands was observed as these are sensitive avian areas, other wetlands were assigned 500 m buffers. With regards to rivers, a buffer of 2 km from perennial rivers and 500 m from non-perennial rivers was used. A viewshed protection zone (as calculated by SANParks) was also included for national parks – the zone where development will be visible from within the park.

It is important to note that biosphere reserves have separate areas: core, buffer and transitional. Generally no development is allowed in the core area but certain developments may be permitted in the buffer and transition areas.

It can be seen from the Layer 1 map that a river crosses the proposed site west of Aberdeen. This is mapped as a sensitive area.

» *Topographical (Layer 2)*

Layer 2 illustrates topographical information that are negatively constraining for the development of a wind energy facility. This data includes elevation above sea level (areas above the 150 m range were recorded as a negative) and slope, where slopes with a gradient steeper than 1:4 were not preferred/not considered as ideal locations for development. This layer has an important influence on landscape character types as, in addition to exclusionary buffers around or on ridgelines, mountains and hills, the analysis should seek to determine coastal and inland plains, as well as foothill landscape types which may have positive locational attributes for wind turbines. In addition to elevation, this map layer also utilises slope (greater than 1:4) to determine significant topographical features, and defines ridgelines as a fundamental exclusionary layer due to visual impact concerns of wind turbines breaking skylines.

It can be seen from the Layer 2 map that **no constraints** in terms of topography were identified for the proposed site to the west of Aberdeen.

Planning Criteria

» *Urban and Industrial Areas (Layer 3)*

Layer 3 illustrates input layers pertaining to planning: urban and industrial criteria (as per the DEA&DP guideline). For urban residential areas a 1 km buffer was applied. Industrial areas were assigned a 5km **positive buffer** as these are already disturbed and developed landscapes and therefore the siting of the proposed wind energy facility near industrial areas is generally preferred.

It can be seen from the Layer 3 map that **there are no constraints or positive buffers** associated with the proposed site to the west of Aberdeen.

» *Coastal Buffer Area (Layer 4)*

Layer 4 relates to a coastal buffer area. As the proposed site is located inland, this layer is not relevant and is therefore not included.

Infrastructural Criteria

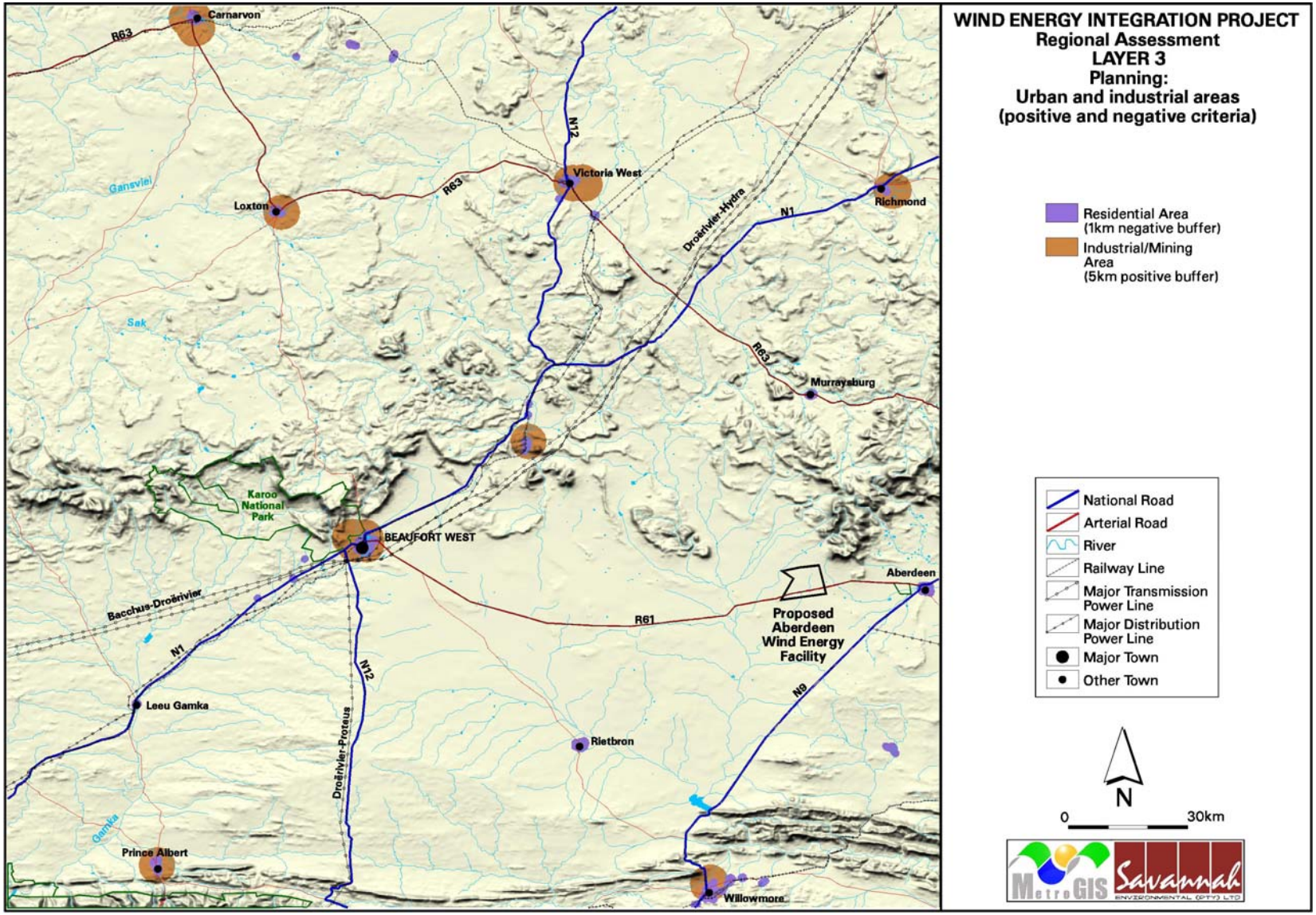
» *Airports and Security Sites (Layer 5)*

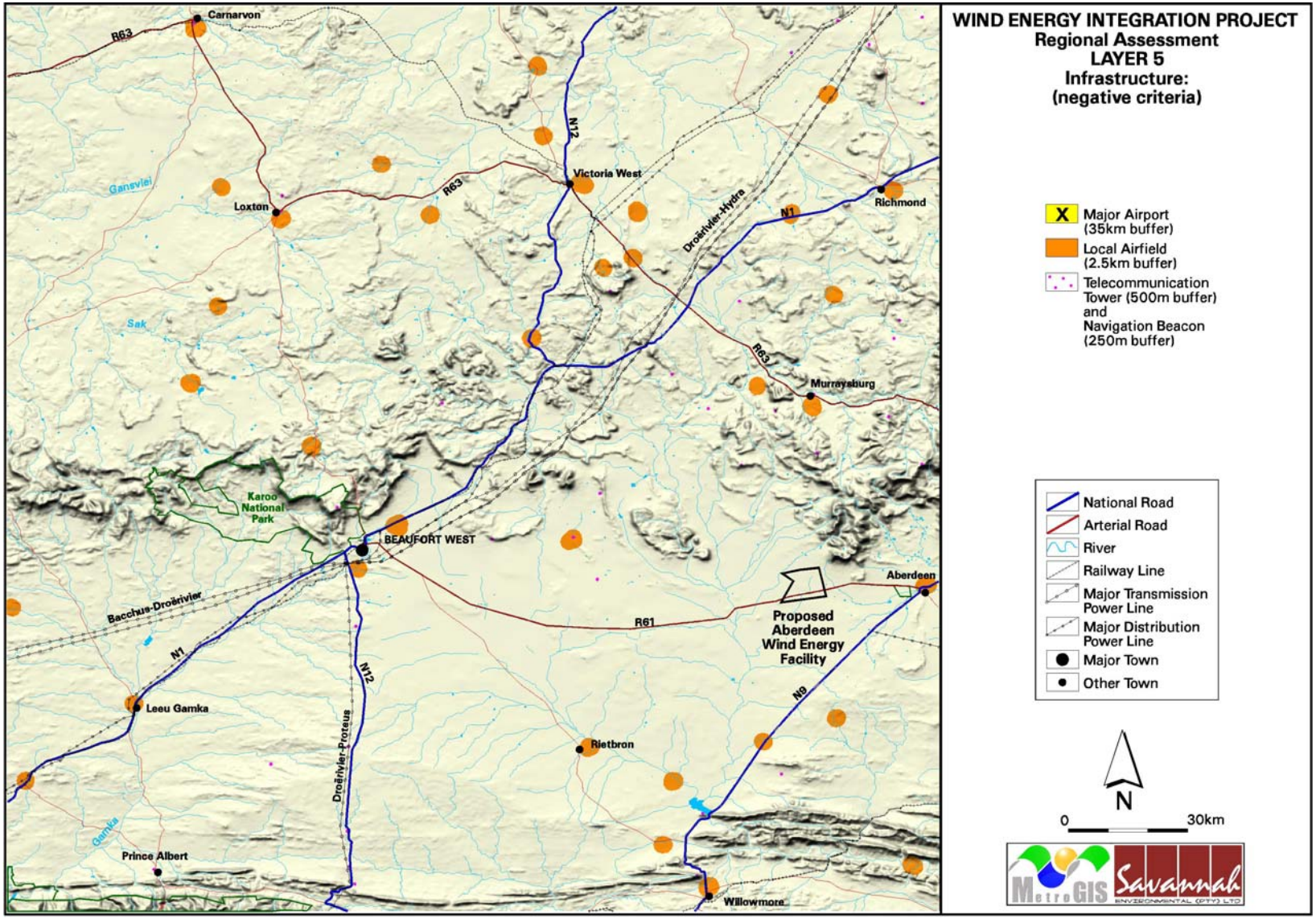
Layer 5 includes infrastructure criteria that would be negatively affected by the development of a Wind Energy Facility. A 35 km buffer around major airports and a 3 km buffer around local airfields are applicable for this study due to wind turbines affecting radar devices. However development **may be allowed** within a 35 km buffer area of an airport depending on the exact location and layout of the wind energy facility, through negotiation with the Civil Aviation Authority.

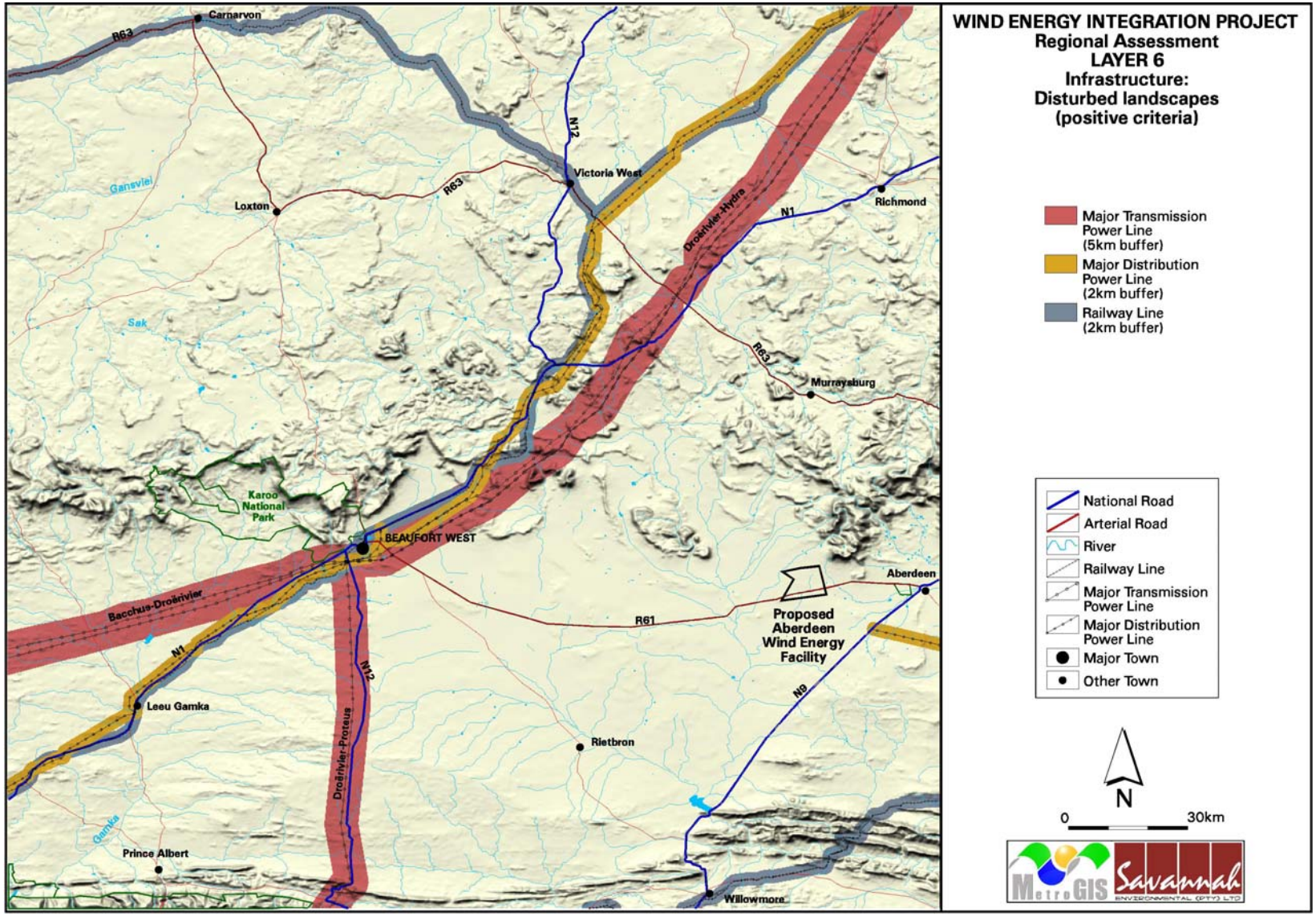
» *Other Infrastructure (Layer 5)*

A 500m buffer around cell masts or communication towers and a 250m buffer around radio and navigation beacons were recommended in the DEA&DP document.

It can be seen from the Layer 5 map that **no constraints** in terms of airports and security sites were identified for the proposed development site.


WIND ENERGY INTEGRATION PROJECT
Regional Assessment
LAYER 3
Planning:
Urban and industrial areas
(positive and negative criteria)
Residential Area
(1km negative buffer)
Industrial/Mining
Area
(5km positive buffer)
National Road
Arterial Road
River
Railway Line
Major Transmission
Power Line
Major Distribution
Power Line
Major Town
Other Town
N
0
30km
Carnarvon
Loxton
Victoria West
Richmond
Murraysburg
Aberdeen
BEAUFORT WEST
Karoo
National
Park
Proposed
Aberdeen
Wind Energy
Facility
Leeu Gamka
Rietbron
Prince Albert
Willowmore
R63
N12
N1
R61
N9
Gansvlei
Sak
Gamka
Bacchus-Droërivier
Droërivier-Hydra
Droërivier-Proteus


WIND ENERGY INTEGRATION PROJECT
Regional Assessment
LAYER 5
Infrastructure:
(negative criteria)
Major Airport (35km buffer)
Local Airfield (2.5km buffer)
Telecommunication Tower (500m buffer) and Navigation Beacon (250m buffer)
National Road
Arterial Road
River
Railway Line
Major Transmission Power Line
Major Distribution Power Line
Major Town
Other Town
N
0
30km
Carnarvon
Loxton
Victoria West
Richmond
Murraysburg
Aberdeen
BEAUFORT WEST
Karoo National Park
Leeu Gamka
Rietbron
Prince Albert
Willowmore
Proposed Aberdeen Wind Energy Facility
R63
N12
N1
R61
N9
Gansvlei
Sak
Gamka
Bacchus-Droërivier
Droërivier-Hydra
Droërivier-Proteus


WIND ENERGY INTEGRATION PROJECT
Regional Assessment
LAYER 6
Infrastructure:
Disturbed landscapes
(positive criteria)
Major Transmission Power Line (5km buffer)
Major Distribution Power Line (2km buffer)
Railway Line (2km buffer)
National Road
Arterial Road
River
Railway Line
Major Transmission Power Line
Major Distribution Power Line
Major Town
Other Town
N
0
30km
Carnarvon
R62
Loxton
Gansvlei
Sak
R63
Victoria West
N12
Droërivier-Hydra
N1
Richmond
Murraysburg
Karoo National Park
BEAUFORT WEST
Bacchus-Droërivier
N1
Leeu Gamka
Droërivier-Proteus
N12
R61
Proposed Aberdeen Wind Energy Facility
Aberdeen
N9
Rietbron
Gamka
Prince Albert
Willowmore

Landscape Based Assessment

Infrastructural Criteria

» *Vertical and Disturbed Landscapes (Layer 6)*

Positive criteria for the development of a wind energy facility were identified in the form of vertically disturbed landscape corridors within the study areas. As opposed to the previous negative map layers, this is a positive (inclusionary) map layer that recognises "vertical and disturbed" landscapes as a primary-level criterion for location of wind energy developments from a landscape perspective. The intent of inclusionary buffers is the location of wind energy developments as close as possible to landscapes that are already compromised by vertical structures such as power lines. A 5 km positive buffer for transmission power lines and a 2 km positive buffer for smaller distribution power lines were used. Situating the development near power lines is also regarded as being positive from a technical perspective. Situating the development within 2km of landscapes disturbed by railway lines is also considered to be a positive. These features are shown on **Layer 6**.

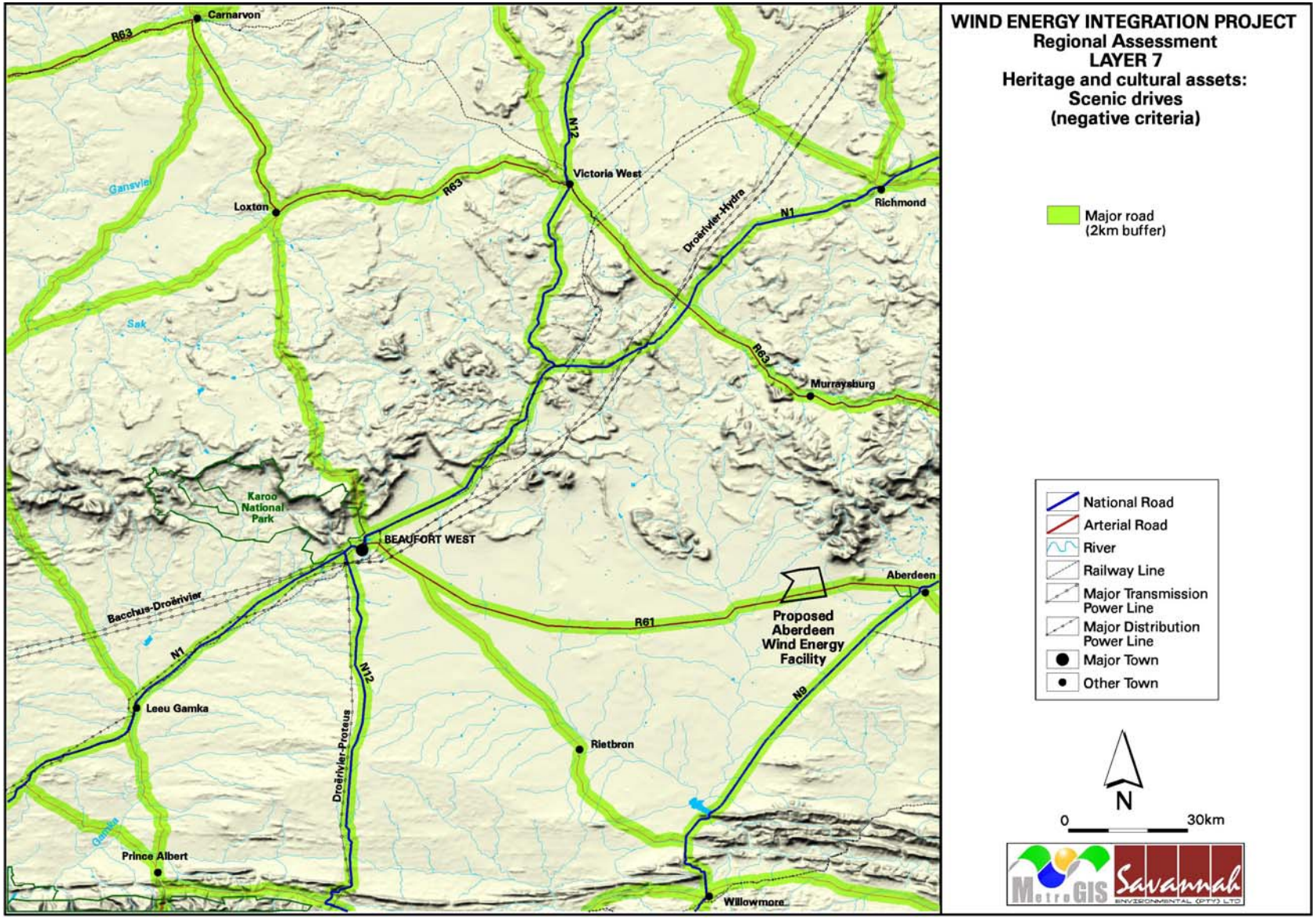
It can be seen from the Layer 6 map that the proposed site to the west of Aberdeen is located some distance from transmission and distribution infrastructure.

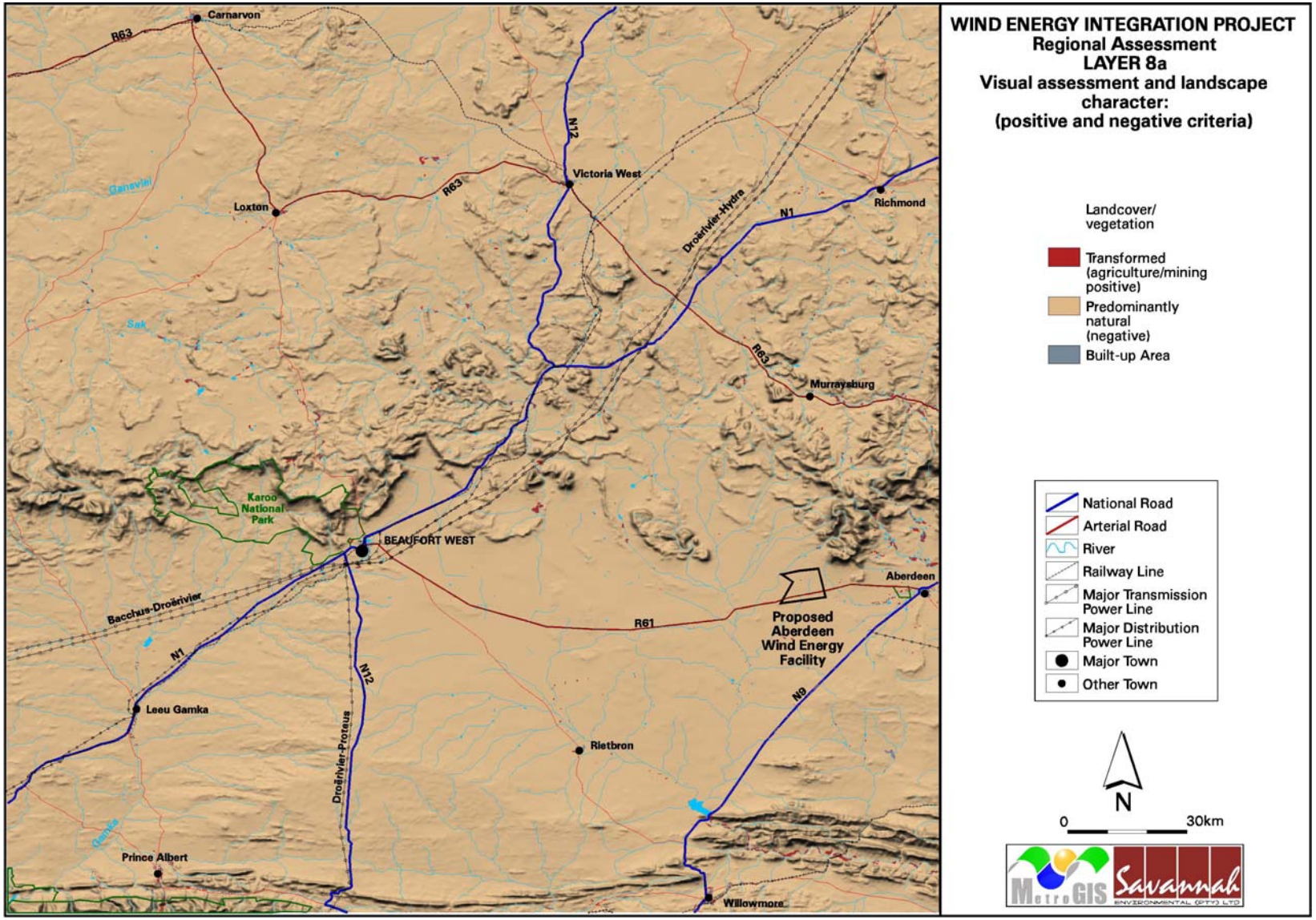
Landscape and Cultural Criteria

» *Scenic Drives and Heritage Sites (Layer 7)*

Layer 7 in the DEA&DP study refers to the delineation of heritage and cultural assets, as well as scenic drives and cultural routes, as negative criteria. No specific information regarding heritage sites within the study areas was available at the time of undertaking this assessment. Specific sites of heritage value would, however, be identified during a site-specific EIA and would be demarcated as potentially sensitive areas within the proposed development site, depending on their level of significance. As it is difficult to assess routes which could potentially have scenic value associated with them, and as no specific information regarding scenic routes within the study area was available at the time of undertaking the assessment, a simple 2 km negative buffer was used around all major roads. This is inclusive of most of the possible scenic routes in the study areas.

It can be seen from the Layer 7 map that the major road R61 cuts across the proposed site to the west of Aberdeen.


WIND ENERGY INTEGRATION PROJECT
Regional Assessment
LAYER 7
Heritage and cultural assets:
Scenic drives
(negative criteria)
Major road
(2km buffer)
National Road
Arterial Road
River
Railway Line
Major Transmission Power Line
Major Distribution Power Line
Major Town
Other Town
N
0
30km
Carnarvon
Loxton
Victoria West
Richmond
Murraysburg
Aberdeen
BEAUFORT WEST
Karoo National Park
Proposed Aberdeen Wind Energy Facility
Leeu Gamka
Rietbron
Prince Albert
Willowmore
R63
N12
N1
R61
N9
Gansvlei
Sak
Bacchus-Droërivier
Droërivier-Hydra
Droërivier-Proteus
Gamka


WIND ENERGY INTEGRATION PROJECT
Regional Assessment
LAYER 8a
Visual assessment and landscape character:
(positive and negative criteria)
Landcover/ vegetation
Transformed (agriculture/mining positive)
Predominantly natural (negative)
Built-up Area
National Road
Arterial Road
River
Railway Line
Major Transmission Power Line
Major Distribution Power Line
Major Town
Other Town
N
0
30km
Carnarvon
Loxton
Victoria West
Richmond
Murraysburg
Aberdeen
BEAUFORT WEST
Karoo National Park
Proposed Aberdeen Wind Energy Facility
Leeu Gamka
Rietbron
Prince Albert
Willowmore
Bacchus-Droërivier
Droërivier-Hydra
Droërivier-Proteus
R63
N12
N1
R61
N9
Ganaviel
Sak
Gamka
MetroGIS
Savannah
ENVIRONMENTAL (PTY) LTD

Visual Assessment and Landscape Character

» *Landscape Character and Visual Assessment (Layer 8)*

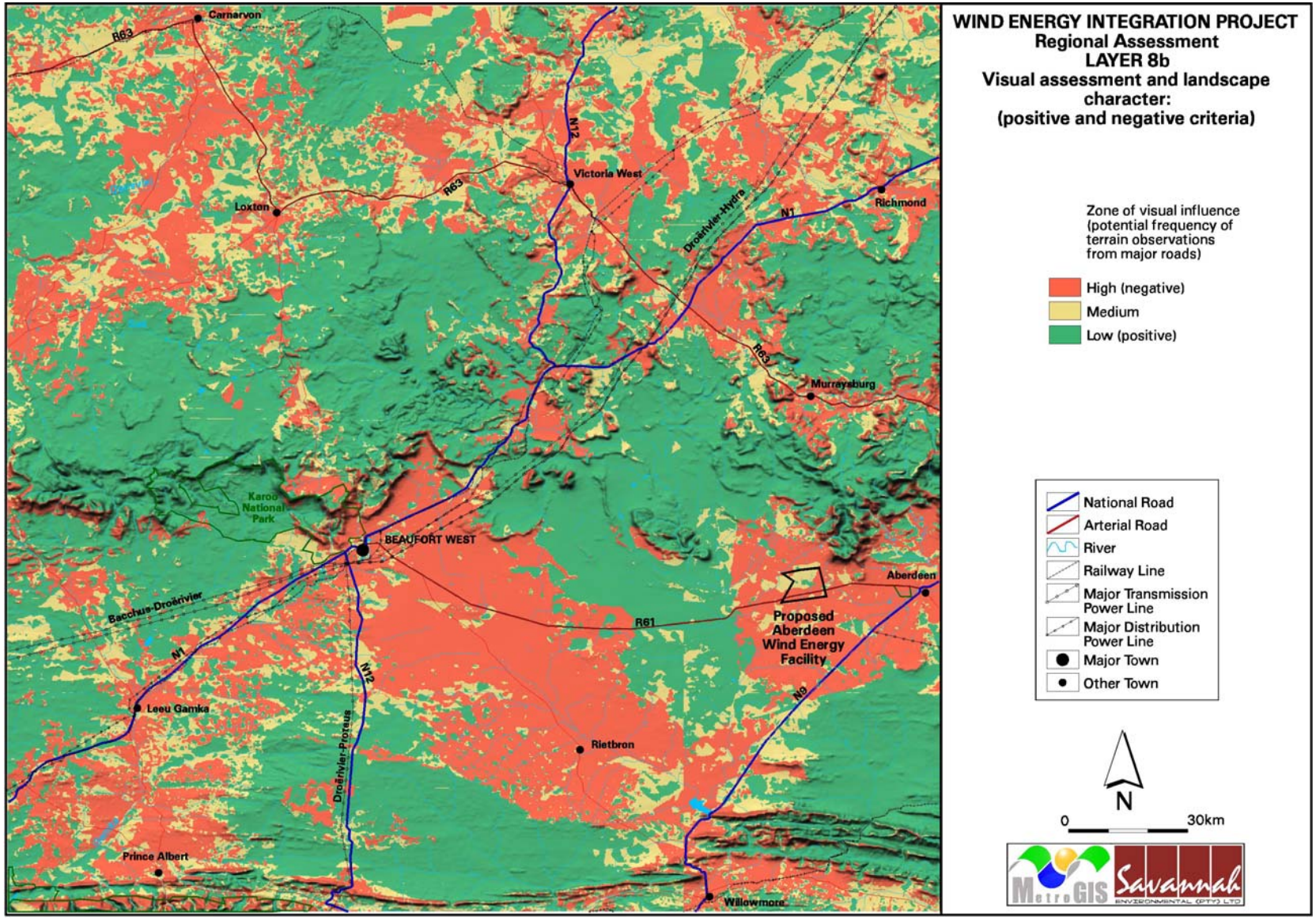
A landscape-based assessment was completed according to the methodology as set out in *Report 3: Methodology 2* of the DEA&DP guideline report, and is aimed at defining landscape character types and their relative visual sensitivity and capacity to absorb wind energy facility development.

Layer 8a indicates areas that have been permanently transformed, predominantly by agricultural and mining practises. Other areas that are indicated as '*Predominantly Natural'* include areas considered to be natural vegetation and/or land cover types with varying levels of disturbance (e.g. from grazing practices) that are not considered as severe as the transformed areas. 'Predominantly Natural' areas are not mapped as ultimate negative areas in the final mapping overlays. This is due to the broad scale at which this data is available. In this regard, areas mapped as being predominantly natural may, in reality, be largely disturbed. This can only be determined at a site-specific level during the EIA process or through a site-specific survey of the proposed development area. Potentially sensitive areas on the site would be demarcated at the EIA stage for consideration in the layout design of the facility.

From the Layer 8a map it can be seen that the majority of the area surrounding the proposed study area is indicated as being predominantly natural at this scale.

Layer 8b is a composite of the results of visibility analyses undertaken from vantage points along roads within the study area. The resultant index identifies areas that are more frequently exposed to both the national and provincial roads (highly visible areas); areas exposed to either the national road or the provincial roads (visible areas) and areas that are not exposed to any of the major roads within the study area. From the Layer 8b map it can be seen that the proposed study area to the west of Aberdeen is indicated as being within a zone of high to low visual influence.

Layer 8c shows the major topographical units within the study area, identifying negative/sensitive units (river valleys, mountains, hills and coastal forelands) and open landscapes (positive units) in the form of large plains. From the Layer 8c map it can be seen that the majority of the area to the west of Aberdeen is located within an area indicated as plains and slightly undulating plains.


WIND ENERGY INTEGRATION PROJECT
Regional Assessment
LAYER 8b
Visual assessment and landscape character:
(positive and negative criteria)
Zone of visual influence (potential frequency of terrain observations from major roads)
High (negative)
Medium
Low (positive)
National Road
Arterial Road
River
Railway Line
Major Transmission Power Line
Major Distribution Power Line
Major Town
Other Town
N
0
30km
Carnarvon
Loxton
Victoria West
Richmond
Murraysburg
Aberdeen
BEAUFORT WEST
Karoo National Park
Proposed Aberdeen Wind Energy Facility
Leeu Gamka
Rietbron
Prince Albert
Willowmore
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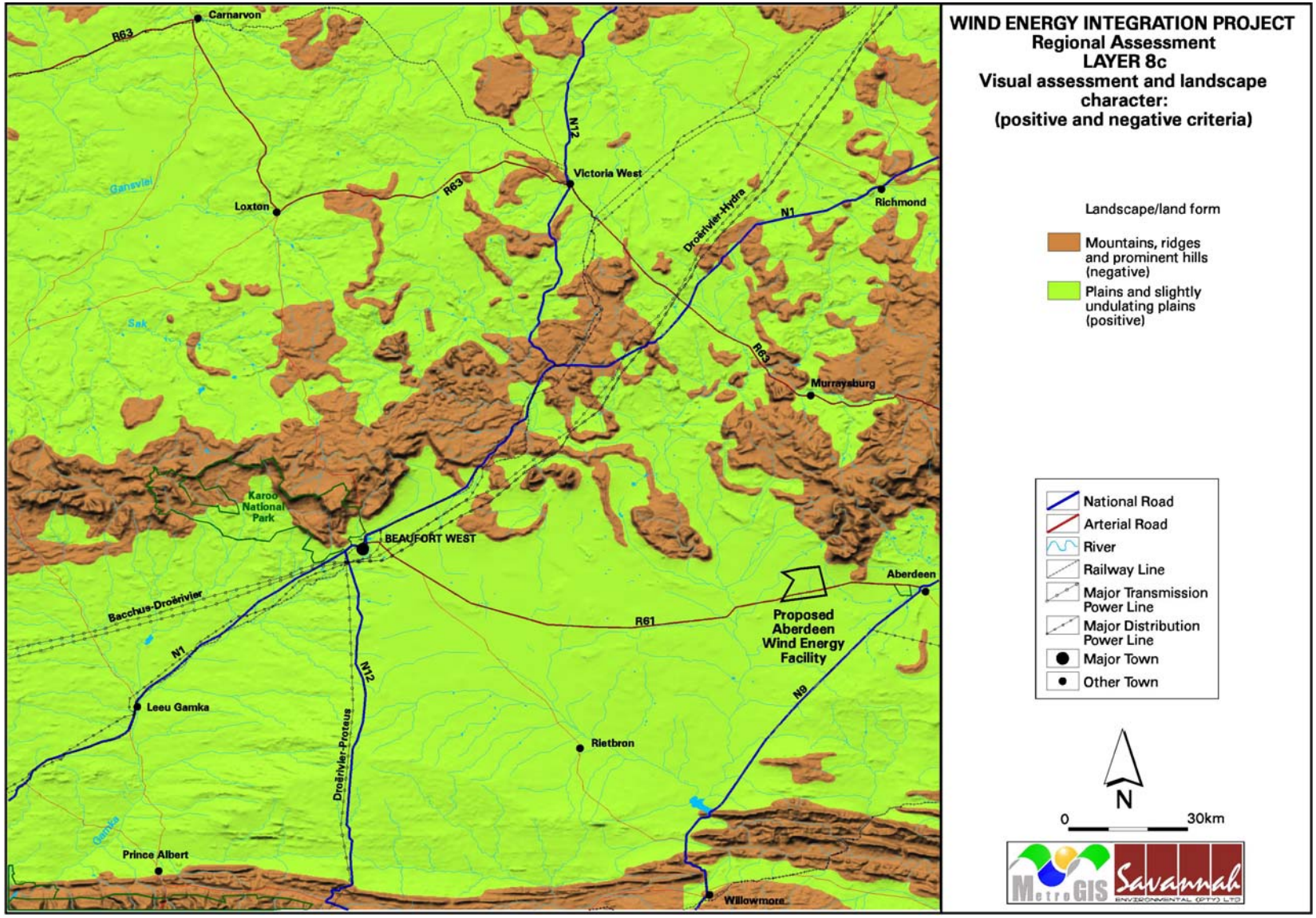
R61
N9
Droërivier-Hydra
Bacchus-Droërivier
Droërivier-Proteus


WIND ENERGY INTEGRATION PROJECT
Regional Assessment
LAYER 8c
Visual assessment and landscape character:
(positive and negative criteria)
Landscape/land form
Mountains, ridges and prominent hills (negative)
Plains and slightly undulating plains (positive)
National Road
Arterial Road
River
Railway Line
Major Transmission Power Line
Major Distribution Power Line
Major Town
Other Town
N
0
30km
Carnarvon
Loxton
Victoria West
Richmond
Murraysburg
Aberdeen
BEAUFORT WEST
Karoo National Park
Leeu Gamka
Prince Albert
Rietbron
Willowmore
Proposed Aberdeen Wind Energy Facility
R63
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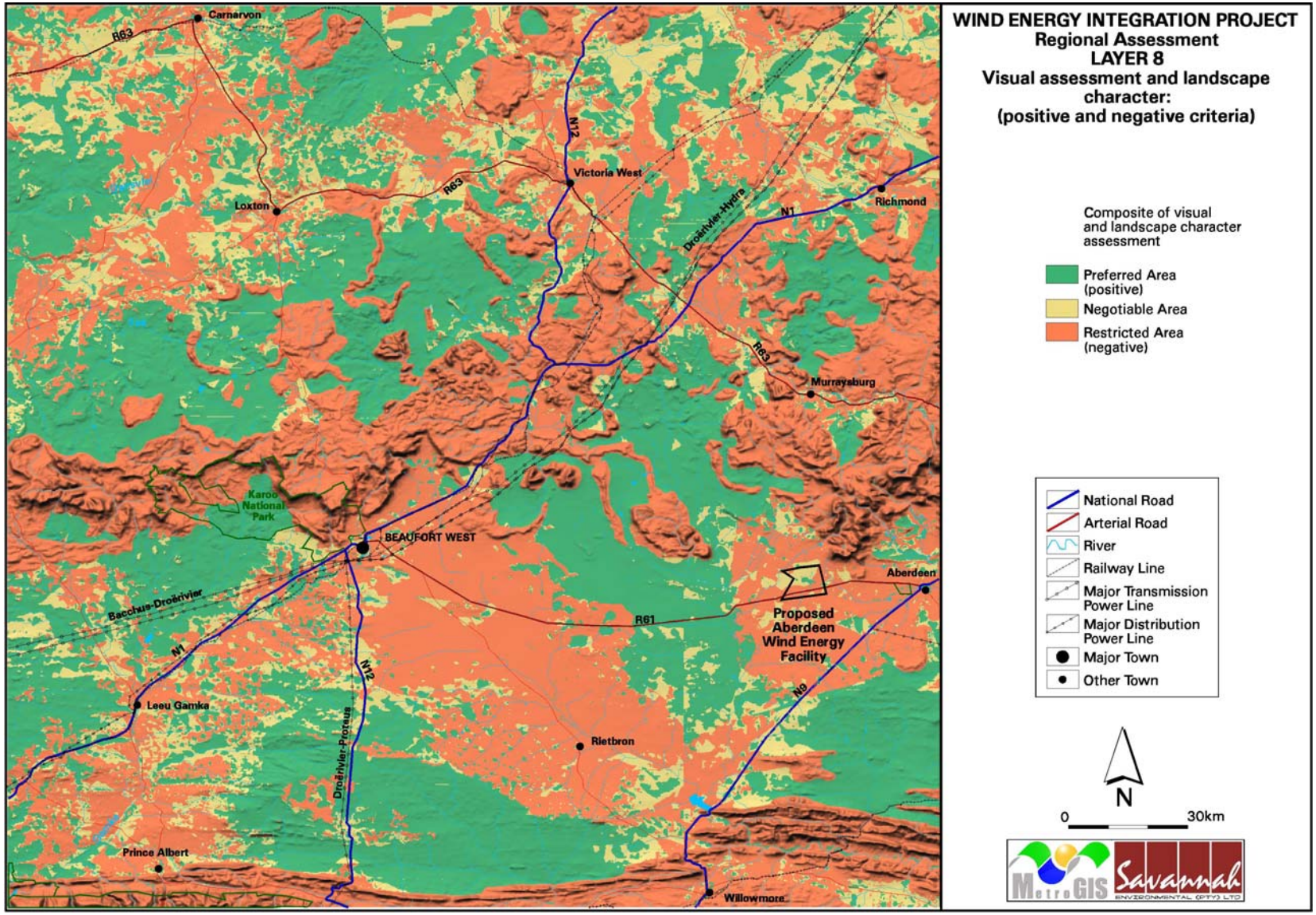
Gamka
Bacchus-Droërivier
Droërivier-Hydra
Droërivier-Proteus


WIND ENERGY INTEGRATION PROJECT
Regional Assessment
LAYER 8
Visual assessment and landscape character:
(positive and negative criteria)
Composite of visual and landscape character assessment
Preferred Area (positive)
Negotiable Area
Restricted Area (negative)
National Road
Arterial Road
River
Railway Line
Major Transmission Power Line
Major Distribution Power Line
Major Town
Other Town
N
0
30km
Carnarvon
Loxton
Victoria West
Richmond
Murraysburg
Aberdeen
BEAUFORT WEST
Karoo National Park
Proposed Aberdeen Wind Energy Facility
Leeu Gamka
Rietbron
Prince Albert
Willowmore
R63
N12
N1
R61
N9
Droërivier-Hydra
Bacchus-Droërivier
Droërivier-Proteus

Layer 8 shows the composite result of the Landscape Character and Visual Assessment as *Preferred Areas, Negotiable Areas* and *Restricted Areas* for development. The results displayed on Layer 8 are a composite of a criteria assessment of three input data categories, namely: vegetation/land cover, zone of visual influence and land form/topography. The input data categories were assessed in order to form positive or negative criteria that would aid in determining the landscape character and ultimately areas where development would be acceptable or areas where development would be unacceptable. The following table broadly indicates the positive or negative criteria per input category.

Input Category	Positive Criteria	Negative Criteria
Vegetation/Land Cover (Source: NLC2000)	Areas largely transformed by agriculture, mining, etc.	Areas with predominantly natural vegetation
ZVI Viewshed Analysis	Areas largely hidden from main transport routes (national and provincial roads)	Areas that are highly exposed from major transport routes
Land Form/Topography	Large plains	Mountains and hills, coastal forelands and river valleys/estuaries

From the Layer 8 map it can be seen that the majority of the area to the west of Aberdeen is located within a restricted area largely due to its proximity to major roads in the area.

Composite Result - Preferred Areas for Development

The resultant composite of all the input criteria is illustrated in **Figure 4.1**. This map indicates **preferred areas for development** within all the study areas as various combinations of positive and negative criteria. The table below indicates the possible combinations (based on the DEA&DP study) that resulted in the preferred areas for development index that is displayed in the map legend.

No.	Description	Preference
1	Areas with more than 1 negative criteria	Highly restricted
2	Areas with one negative criteria	Restricted
3	Neutral areas (no positive or negative criteria)	Negotiable
4	Areas with one positive criteria (and no negative criteria)	Preferred
5	Areas with more than one positive criteria (and no negative criteria)	Highly preferred

The rating system utilised in the regional assessments takes a more 'risk averse approach' than that put forward by the DEA&DP guideline. The rating system used assumes that a criteria rated as negative would always override a criteria rated as positive.

Definition of the terms used to define the level of preference:

» ***Highly Preferred / Preferred:*** Low landscape value with a high to low capacity for change. Wind energy facility development may be possible, subject to site level assessment.
» ***Negotiable:*** Low to high landscape values, but with a high capacity to absorb change. Wind energy development in these areas may be possible, subject to site level assessment.
» ***Restricted / High Restricted:*** High value landscapes combined with low capacity of landscape to adapt to change. These areas should be restricted from wind energy facility development.

Figure 4.1 also shows the most favourable potential areas for development of a wind energy facility from an environmental perspective. The proposed methodology, as set out by the Western Cape Provincial Government document: *Strategic Initiative to Introduce Commercial Land Based Wind Energy Development to the Western Cape* also allows for the consideration of technical criteria, when available and relevant, particularly wind resource data. These have been considered by Eskom in the identification of a proposed site for development.

It can be seen from the map (Refer to Figure 4.1) which follows that:

» This site includes areas of negotiable, restricted and highly restricted areas for development in terms of the results of the Regional Assessment. Restrictions are due to the presence of rivers, proximity to roads, presence of natural vegetation and the visual exposure.
» The southern portion of the site falls within an area indicated as being highly restricted. This is due to the proximity to the R61 and visual concerns.
» The remainder of the site falls within an area indicated as being restricted or negotiable (i.e. areas with one negative criteria or neutral areas). Small patches of preferred areas occur within the centre of the site.

Although large portions of the site fall within restricted or highly restricted areas, it was concluded that the total area proposed for development of a wind energy facility should be investigated at a site-specific level through an EIA as the issues associated with the restriction of a portion of the site could potentially be successfully mitigated, depending on the affected environment.

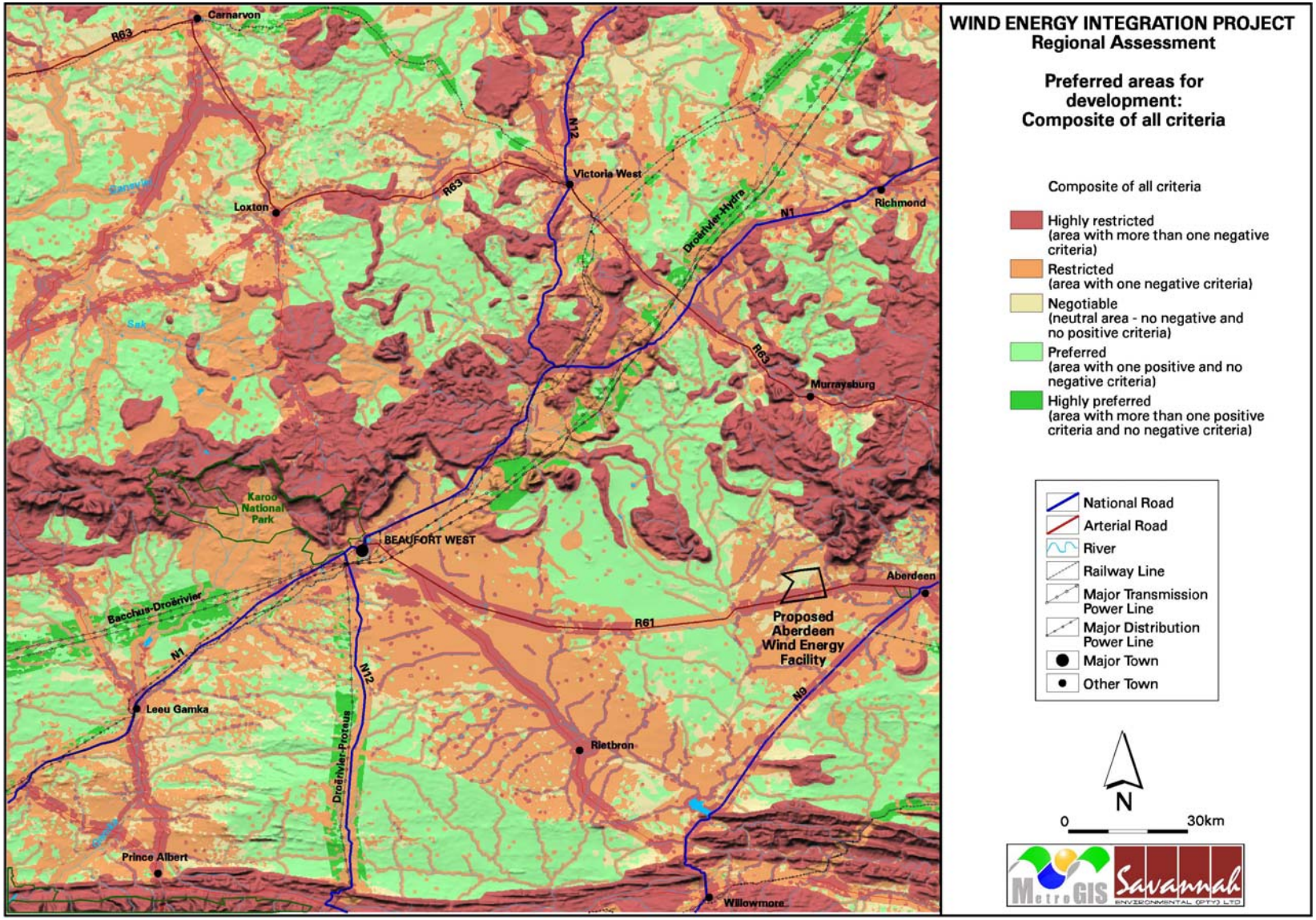


Figure 4.1: Composite map of all criteria of the Regional Assessment indicating the location of the proposed development site

4.4. Discussion of Technical Factors Affecting the Placement of a Wind Energy Facility

The placement of a wind energy facility is highly dependent on technical factors – that is the available wind resource and the terrain. The technical considerations must, therefore, be weighed against other considerations (including environmental considerations) in the determination of a feasible site for the establishment of a viable wind energy facility.

4.4.1. Wind Resource Data and its Relevance to Wind Energy Facilities

The wind resource measured at a meteorological station is determined mainly by two factors:

» the overall weather systems, which usually have an extent of several hundred kilometres, and
» the nearby topography, extending to a few tens of kilometres from the station.

The importance of these factors is discussed in further detail in Chapter 3.

Strictly speaking, the direct use of measured wind speed data for wind resource calculations results in power estimates that are representative only for the actual position and height of the wind-measuring instruments. The application of measured wind speed statistics to wind energy resource calculations in a region therefore requires methods for the transformation of wind speed statistics. Great effort at an international level has gone into the development of simulation tools to estimate resource and terrain dependency, resulting in a comprehensive set of models for the horizontal and vertical extrapolation of meteorological data and the estimation of wind resources. The models are based on the physical principles of flows in the atmospheric boundary layer and they take into account the effect of different surface conditions, shading/sheltering effects due to hills or elevated topography, terrain roughness and relief, vegetation and other obstacles, as well as the modification of the wind imposed by the specific variations of the height of ground around the meteorological station in question. Specialised software (WA_sP - developed by Risø in Denmark), is used by Eskom in the analysis of wind and terrain data on the west coast.

4.4.2. The Terrain and its Relevance to Wind Energy Facilities

The terrain on the west coast can be described as land with an open appearance of roughness length 0,05 m, as defined by the following:

» Terrain class I, i.e. water areas, open farmland, etc.

» Nearby sheltering obstacles such as cliff faces, dunes and valleys.
» Terrain height variations (topography), the most important factor in the study area.

The effect of height variation/relief in the terrain is seen as a speeding-up/slowing-down of the wind due to the topography. These effects of terrain height variations on the wind profile can most clearly be demonstrated by the well-known results from the international field experiments at the Askervein Hill on the Isle of South Uist in the Hebrides (Taylor and Teunissen, 1987; Salmon et al, 1987). Figure 4.2 shows a perspective plot of the Askervein Hill. The line along which measurements of wind speed and direction were recorded is indicated by the meteorological towers in Figure 4.2.

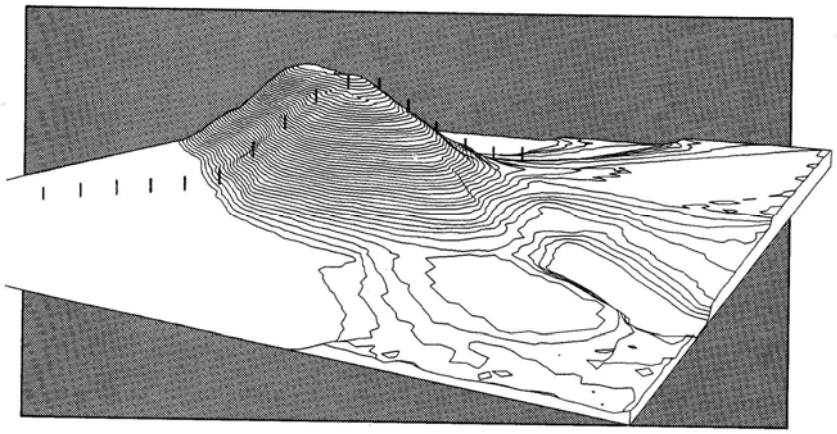


Figure 4.2: Perspective plot of the Askervein Hill

The experimental data recorded is illustrated in Figure 4.3 with the relative speed-up/slow-down (ΔS) at 10 m above ground level plotted against the distance from the crest. The relative speed variation ΔS is defined as:

$$\Delta S = \frac{u_2 - u_1}{u_1} \quad (1)$$

where u_2 and u_1 are the wind speeds at the same height above ground level at the top of the hill and over the terrain upstream of the hill, respectively.

From the results the following can clearly be seen:

» The speed-up at the crest is 80% as compared with the undisturbed upstream mean wind speed.
» The negative speed-up (slow-down) in the front and lee of the elevated ground/hill is 20% to 40% as compared with the undisturbed upstream mean wind speed.

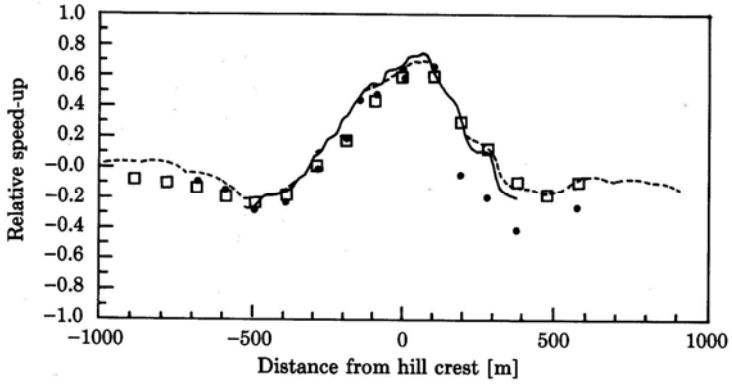


Figure 4.3: Relative speed-up ratios for flow over the Askervein hill at 10m above ground level. Measurements are indicated by dots and results from the orographic model by squares

If R is defined R as the characteristic radius of the elevated ground/hill, typically at the half-width diameter with h the height an approximate expression for ΔS can be found in Jensen *et al*. (1984):

$$\Delta S = 2\frac{h}{R} \qquad (2)$$

It is evident from the above example that elevated ground/hills exert a profound influence on the flow of air, and this has to be taken into account in the placement of turbines. It is often difficult (and impossible in complicated terrain) to apply simple formulas such as Equation 2. For this reason, it is necessary to determine the wind resource at specific locations and then in most cases to use a numerical fluid dynamic model for the calculations as found typically in WA_sP.

4.4.3. Consideration of Technical Factors

The identified area as indicated in Figure 4.1 is, in terms of the results of the Regional Assessment, a potentially feasible area for development. The placement of a wind energy facility in this area must, however, consider the following technical factors:

» Predominant wind direction
» Obstruction obscuring the wind farm in the topography (slightly undulating plains etc. causing shading effects and turbulence of air flow)
» Land - size and availability for layout
» Effect of adjacent turbines – minimum spacing (due to wake turbulence)
» Practicality of layout (underground electrical infrastructure length and interlinking roads)

Based on the consideration of the above factors, as well as the outcomes of the Regional Assessment process (which considers environmental and planning criteria), a potentially feasible site for further investigation has been identified (refer to Figure 4.4).

4.5. Identification of a Site for Investigation in the EIA Process

Following the regional assessment, it was Eskom's intention to proceed with an EIA process for the proposed Wind Energy Facility. As this Regional Assessment has guided Eskom to site/locate their proposed facility within an area/zone of preference (as per the regional methodology followed), no alternative locations/sites will be required to be considered through the EIA process.

The demarcated area is an indicative area (approximately 8 198 ha in extent) considered to be favourable/most viable for the development of a large-scale Wind Energy Facility. This area comprises the following farm portions:

» Portion 3 of Sambokdoorns 92
» RE of Portion 4 of Sambokdoorns 92
» RE of Sambokdoorns 92
» Portion 1 of Klipdrift 73
» Portion 2 of Farm 94, and
» RE of Portion 2 of Farm 94 (refer to Figure 4.2).

The demarcated area is considerably larger than that area required for the facility (as only ~10% of the proposed site will be disturbed by the proposed wind energy facility), which allows for a degree of flexibility in turbine placement to accommodate both technical factors (wind resource and/or lie of the land) and environmental factors (sensitive environmental receptors). This broader area (as reflected in Figure 4.4) has been considered within this Draft Scoping Report.

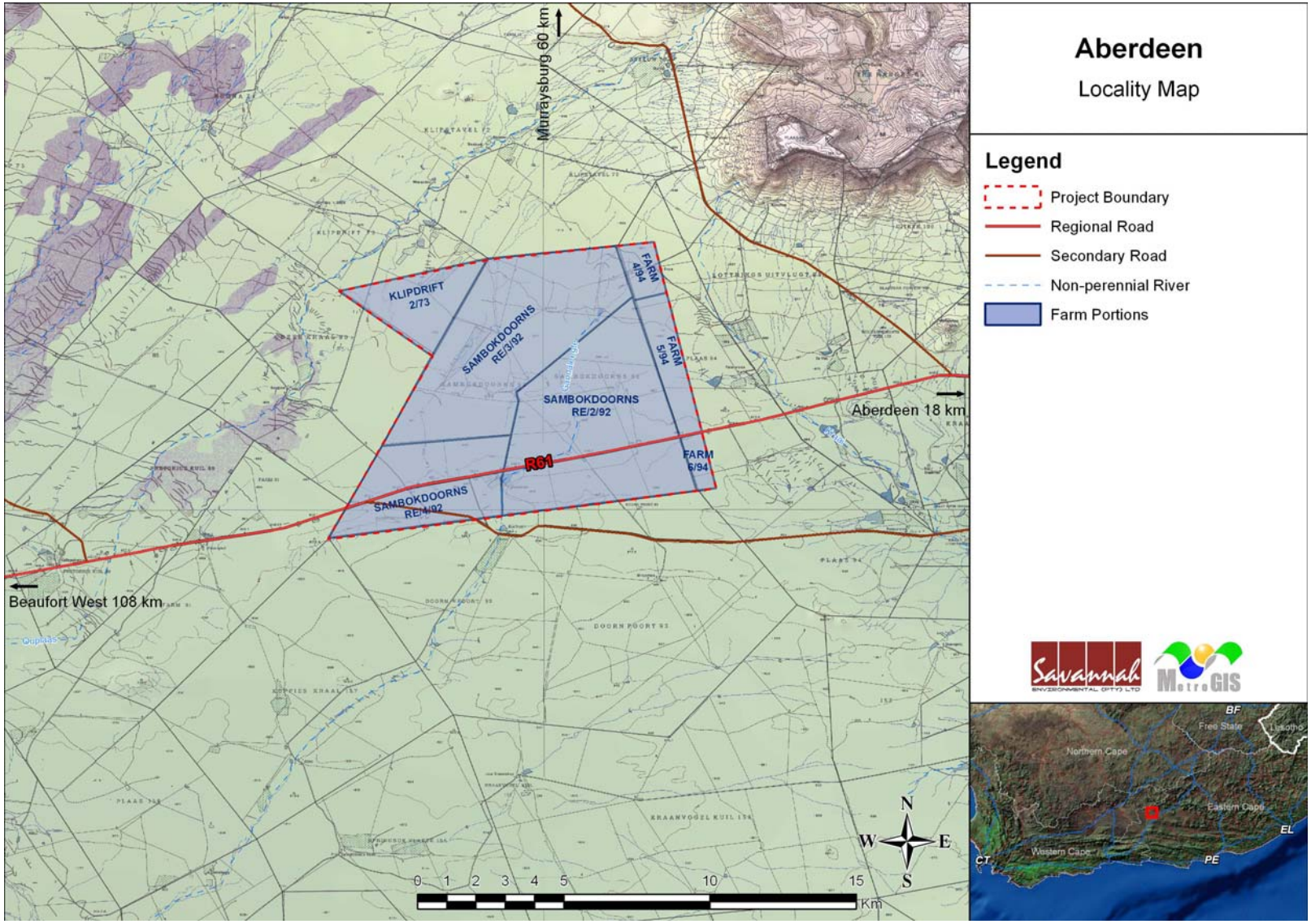


Figure 4.4: Locality map showing the study area for the establishment of the Aberdeen 200MW Wind Farm

APPROACH TO UNDERTAKING THE SCOPING PHASE CHAPTER 5

An Environmental Impact Assessment (EIA) refers to the process involving the identification and assessment of direct, indirect and cumulative environmental impacts associated with a proposed project. The EIA process comprises two Phases: a **Scoping Phase** and an **EIA Phase**. The Scoping Phase culminates in the submission of a Scoping Report to the Department of Environmental Affairs as the competent authority for review and acceptance before proceeding onto the EIA Phase of the process. The EIA Phase culminates in the submission of an Environmental Impact Report (EIR), including an Environmental Management Programme (EMP), to the competent authority for review and decision-making.

The phases of the EIA process are as follows:

Figure 5.1: The four phases of the EIA process

The Scoping Phase for the proposed Aberdeen 200MW Wind Farm has been undertaken in accordance with the EIA Regulations GNR543, published in Government Notice 33306 of 18 June 2010, in terms of Section 24(5) of the National Environmental Management Act (NEMA; Act No. 107 of 1998). This **Draft Scoping Report** aimed to identify and describe potential environmental impacts associated with the proposed project and to define the extent of the specialist studies required within the EIA process. This was achieved through an evaluation of the proposed project involving specialists (with expertise relevant to the nature of the project and the study area), the project proponent, as well as a consultation process with key stakeholders, relevant government authorities and **interested and affected parties (I&APs)**. This chapter outlines the process which was followed during the Scoping Phase of the EIA process and outlines the applicable legislation for the proposed project.

5.1. Objectives of the Scoping Phase

The Scoping Phase aims to:

» Describe the **baseline / affected environment** prior to development.

» **Identify potential environmental and social impacts** (both positive and negative) associated with the construction and operation phases of the proposed development, through a desktop review of existing baseline data and specialist studies.
» Make **recommendations regarding more detailed studies** required in the EIA phase of the process.
» Provide **interested and affected parties** with an opportunity to have **input** on the proposed project through consultation and review of the Draft Scoping Report.
» Provide the authorities with **sufficient information** in order to make a decision regarding the scope of issues to be addressed in the EIA process, as well as regarding the scope and extent of specialist studies that will be required as part of the EIA Phase.

Within this context, the objectives of this Scoping Phase are to:

» Describe the **scope** and **nature** of the proposed development.
» Describe the reasonable and feasible project-specific **alternatives** to be considered through the EIA process, including the 'no-go' option.
» Identify and evaluate key **environmental issues or impacts** associated with the proposed project and, through a process of broad-based consultation with I&APs and stakeholders and desk-top specialist studies, identify those issues to be assessed in more detail in the EIA Phase of the EIA process.
» Conduct an open, participatory and transparent **public involvement process** and facilitate the inclusion of I&AP and stakeholder concerns regarding the proposed project in the decision-making process.

5.2. Regulatory and Legal Context

The regulatory hierarchy for an energy generation project of this nature consists of three tiers of authority which exercise control through both statutory and non-statutory instruments – that is National, Provincial and Local levels.

As wind energy developments are multi-sectoral, encompassing economic, spatial, biophysical, and cultural dimensions, various statutory bodies are likely to be involved in the approval process for the proposed facility.

5.2.1. Regulatory Hierarchy

At the National Level, the main regulatory agencies are:

» *Department of Energy:* This department is responsible for policy relating to all energy forms, including renewable energy, and are responsible for forming and approving the IRP (Integrated Resource Plan for Electricity) (Integrated

Resource Plan for Electricity 2010 – 2030, 2011). Wind energy is considered under the White Paper for Renewable Energy (2003) and the Department undertakes research in this regard. It is the controlling authority in terms of the Electricity Regulation Act (Act No 4 of 2006).

» *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.
» *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 agency of the Department of Transport is responsible for all National road routes.
» *Department of Water Affairs (DWA):* This department is responsible for effective and efficient water resources management to ensure sustainable economic and social development.
» *Department of Forestry and Fishery (DAFF):* This department the custodian of South Africa's agriculture, fisheries and forestry resources and is primarily responsible for the formulation and implementation of policies governing the Agriculture, Forestry and Fisheries Sector.

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 the commenting authority for this project.
» *Department of Transport and Public Works - Eastern Cape.* This department is responsible for roads and the granting of exemption permits for the conveyance of abnormal loads on public roads.
» *Eastern Cape Department of Agriculture and Rural Development* – This is the provincial authority responsible for the management of agricultural areas.

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 Municipalities (i.e. Camdeboo Local Municipality) and District Municipalities (i.e. Cacadu District Municipality) play a role.

There are also numerous non-statutory bodies and environmental lobby groups within the study area that play a role in various aspects of planning and the environment that will influence wind energy development.

5.2.2. Legislation and Guidelines that have informed the preparation of this Scoping Report

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

» National Environmental Management Act (Act No. 107 of 1998)
» EIA Regulations, published under Chapter 5 of the NEMA (GNR R543 in Government Gazette 33306 of 18 June 2010)
» Guidelines published in terms of the NEMA EIA Regulations, in particular:
  * Companion to the National Environmental Management Act (NEMA) Environmental Impact Assessment (EIA) Regulations of 2010 (Draft Guideline; DEA, 2010)
  * Public Participation in the EIA Process (DEA, 2010)
  * Integrated Environmental Management Information Series (published by DEA)
» International guidelines – the Equator Principles and the International Finance Corporation and World Bank Environmental, Health, and Safety Guidelines for Wind Energy (2007)

Several other Acts, standards or guidelines have also informed the project process and the scope of issues evaluated in the Scoping Phase and to be addressed in the EIA Phase. A listing of relevant legislation is provided in Table 5.1 below. A more detailed review of legislative requirements applicable to the proposed project will be included in the EIA Phase.

Table 5.1: Initial review of relevant policies, legislation, guidelines and standards applicable to the proposed Kleinzee 300MW Wind Farm

Legislation	Applicable Sections
National Legislation	
Constitution of the Republic of South Africa (Act No 108 of 1996)	» Bill of Rights (S2) » Environmental Rights (S24) – i.e. the right to an environment which is not harmful to health and well-being » Rights to freedom of movement and residence (S22) » Property rights (S25) » Sufficient water (s27.1.b) » Access to information (S32) » Right to just administrative action (S33) » Recognition of international agreements (S231)

Legislation	Applicable Sections
National Environmental Management Act (Act No 107 of 1998)	» National environmental principles (S2), providing strategic environmental management goals and objectives of the government applicable throughout the Republic to the actions of all organs of state that may significantly affect the environment » NEMA EIA Regulations (GN R543- R546 of 18 June 2010) published in terms of Chapter 5 of the NEMA » Public Participation (S2) » The requirement for potential impact on the environment of listed activities must be considered, investigated, assessed and reported on to the competent authority (S24 – Environmental Authorisations) » Duty of Care (S28) requiring that reasonable measures are taken to prevent pollution or degradation from occurring, continuing or recurring, or, where this is not possible, to minimise & rectify pollution or degradation of the environment » Procedures to be followed in the event of an emergency incident which may impact on the environment (S30) » Appeals against decisions made by authorities (S43)
Environment Conservation Act (Act No 73 of 1989)	» National Noise Control Regulations (GN R154 dated 10 January 1992)
National Heritage Resources Act (Act No 25 of 1999)	» Stipulates assessment criteria and categories of heritage resources according to their significance (S7) » Provides for the protection of all archaeological and palaeontological sites, and meteorites (S35) » Provides for the conservation and care of cemeteries and graves by SAHRA where this is not the responsibility of any other authority (S36) » Lists activities which require developers any person who intends to undertake to notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development (S38) » Requires the compilation of a Conservation Management Plan as well as a permit from SAHRA for the presentation of archaeological sites as part of tourism attraction (S44)

Legislation	Applicable Sections
National Environmental Management: Biodiversity Act (Act No 10 of 2004)	» Provides for the MEC/Minister to list ecosystems which are threatened and in need of protection (S52) – none have as yet been published » Provides for the MEC/Minister to identify any process or activity in such a listed ecosystem as a threatening process (S53) - none have as yet been published » A list of threatened & protected species has been published in terms of S 56(1) - Government Gazette 29657. » Three government notices have been published, i.e. GN R 150 (Commencement of Threatened and Protected Species Regulations, 2007), GN R 151 (Lists of critically endangered, vulnerable and protected species) and GN R 152 (Threatened or Protected Species Regulations).
National Environmental Management: Air Quality Act (Act No 39 of 2004)	» National, provincial and local ambient air quality standards (S9 - 10 & S11) » Listed Activities (S21) » Atmospheric Emissions Licenses (S22) » Measures in respect of dust control (S32) – no regulations promulgated as yet » Measures to control noise (S34) - no regulations promulgated as yet
Conservation of Agricultural Resources Act (Act No 43 of 1983)	» Prohibition of the spreading of weeds (S5) » Classification of categories of weeds & invader plants (Regulation 15 of GN R1048) & restrictions in terms of where these species may occur » Requirement & methods to implement control measures for alien and invasive plant species (Regulation 15E of GN R1048) » Soil protection/conservation, and erosion control
National Water Act (Act No 36 of 1998)	» National Government is the public trustee of the Nation's water resources (S3) » Entitlement to use water (S4) – entitles a person to use water in or from a water resource for purposes such as reasonable domestic use, domestic gardening, animal watering, fire fighting and recreational use, as set out in Schedule 1 » Duty of Care to prevent and remedy the effects of pollution to water resources (S19) » Procedures to be followed in the event of an emergency incident which may impact on a water resource (S20) » Definition of water use (S21)

Legislation	Applicable Sections
	» Requirements for registration of water use (S26 and S34) » Definition of offences in terms of the Act (S151)
Water Services Act (Act No 108 of 1997)	» No person may dispose of industrial effluent except in a manner approved by the water services provider (S7)
Aviation Act (Act No 74 of 1962)	» 13th amendment of the Civil Aviation Regulations (CARs) 1997 » The Minister of Transport has under section 22(1) of the Aviation Act, 1962 made the regulations in the Schedule hereto. » Obstacle limitations and marking outside aerodrome or heliport - CAR Part 139.01.33
National Environmental Management Waste Act (Act No 59 of 2008)	» Waste management measures » GN 718 Regulations and schedules (Schedule A & B) » Listed activities requiring waste licenses » Waste disposal practices (S20) » Contamination
National Forests Act (Act No 84 of 1998)	» Protected trees » Conservation of forests
National Roads Act (Act No 7 of 1998)	» Policy concerning use and management of national roads.
Provincial Legislation	
Cape Land Use Planning Ordinance (No 15 of 1985)	» Details land subdivision and rezoning requirements and procedures
Guideline Documents	
South African National Standard (SANS) 10328, Methods for environmental noise impact assessments in terms of NEMA No. 107 of 1998	» Prediction of impact that noise emanating from a proposed development would have on occupants of surrounding land by determining the rating level. » Noise limits are based on the acceptable rating levels of ambient noise contained in SANS 10103
Draft Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and for other Events on Public Roads	» Outlines 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
The White Paper on Renewable Energy (2003)	» National targets for renewable energy generation

5.3. Methodology for the Scoping Phase

The Scoping Phase has been undertaken in accordance with the EIA Regulations published in Government Notice 33306 of 18 June 2010, in terms of NEMA. Key tasks undertaken within the scoping phase are discussed in more detail below.

5.3.1. Authority Consultation and Application for Authorisation in terms of GN No R543 of 2010

As this is an energy generation project, and Eskom is a State Owned Company (SOC), the National Department of Environmental Affairs (DEA) is the competent authority for this application. As the project falls within the Eastern Cape Province, the Eastern Cape Department of Economic Development & Environmental Affairs (Eastern Cape DEDEA) will act as the commenting authority for the application. Consultation with both these authorities has been undertaken throughout the Scoping process and has included the following:

» Pre-application consultation with DEA regarding the proposed project and the Scoping/EIA processes to be undertaken.
» Submission of an application for authorisation to DEA with a copy submitted to Eastern Cape DEDEA. This application was accepted and reference number **12/12/20/2211** was allocated. Acceptance was therefore granted to continue with the Scoping Phase.

A record of all authority consultation undertaken prior to and within the Scoping Phase is included within Appendix B.

5.3.2. Public Participation Process

The aim of the public participation process is primarily to ensure that information containing all relevant facts in respect of the application is made available to potential stakeholders and I&APs. Furthermore, participation by potential I&APs is facilitated in such a manner that all potential stakeholders and I&APs are provided with a reasonable opportunity to comment on the application. And lastly, all comments received from stakeholders and I&APs are recorded, which serve to further direct the specialist studies and the EIA process.

Key steps in the public participation included:

1. **Identification of I&APs and establishment of the I&AP Database**
   Identification of I&APs was undertaken by **Sustainable Futures ZA** (specialist public participation consultant) through existing contacts and databases, recording responses to site notices and newspaper advertisements as well as through the process of networking. The key stakeholder groups identified include:

   * Provincial and local government departments (including DEA, Eastern Cape DEDEA, SAHRA, DWA, DAFF, SANRAL, etc.)

- Government structures (including the provincial roads authority, municipal planning departments, etc)
- Camdeboo Local Municipality and Cacadu Municipality
- Affected and potentially affected neighbouring landowners and tenants
- Local authorities
- Conservation authorities
- CBOs and other NGOs.

The I&AP details were recorded within an I&AP database (refer to Appendix C for a listing of I&APs). The database will be updated on an on-going basis during the EIA process.

2. Distribution Background Information Documents and Reply Forms

In order to provide information regarding the proposed project and the EIA process, a background information document (BID) and reply form for the project was compiled (refer to Appendix E). The BID was distributed to identified stakeholders and I&APs, and additional copies were made available at public venues within the broader study area. BIDs were distributed as follows:

- Spur at Graaff Reinet
- Aberdeen Heritage Archive and Tourism Bureau
- All farmers post boxes at the Aberdeen post office (80 in total)
- Aberdeen Library
- Vanity Fair (Antiques and Gifts)/ Tourism information centre in Aberdeen
- "The beauty of nature" shop in Aberdeen
- Horse Shoe Library in Graaff Reinet

3. Site Notices

Site advertisements were posted at various accessible locations throughout the study area and included locations on-site, on accessible farm portions; and in the town of Aberdeen itself (refer to Appendix D).

The following site notices were placed around the study area:

A3 notices:

- Gate of farm Lottrings Uitvlugt 1/95 (leads to other portions of study area) situated along the R0599 (gravel road between Aberdeen and Murraysburg)
- Along R61 on fence of Portion 2 of Farm 94
- Along R61 on fence of RE of Portion 4 of Sambokdoorns 92

A4 notices:

- Stuck on door of Aberdeen Library

* Stuck on door of Horse Shoe Library in Graaff Reinet
* Notice board at Camdeboo Municipal Building (Mangaliso Robert Sobukwe Memorial Building)
* Notice board of Aberdeen- Camdeboo Municipal building

4. Newspaper Advertisements

In order to notify and inform the public of the proposed project and invite members of the public to register as I&APs; the project and EIA process was advertised in the following newspapers as follows:

* Graaff Reinet Advertiser: 27 May 2011

A second round of newspaper adverts informing the public of the public meeting was also placed in the "Graaff Reinet Advertiser" (9th January 2012) and in the "Burger Oos" (13th January 2012) (refer to Appendix D).

5. Meetings with stakeholders

The public participation process has been structured in a manner which allows for consultation with I&APs at various levels and with different stakeholder groups.

6. Other forms of Public Involvement

In addition to the newspaper advertisements and site notices, key stakeholders and registered I&APs were notified in writing of the commencement of the EIA process. These parties included, *inter alia*:

* Relevant parties from municipalities potentially affected (directly or indirectly) by the proposed project
* Potentially affected landowners
* Organs of state having jurisdiction in respect of any aspect of the activity. including:
  - Department of Energy
  - Department of Water Affairs
  - NERSA
  - Department of Agriculture, Fisheries and Forestry (DAFF)
  - South African Heritage Resources Agency
  - Conservation authorities (WESSA etc.)
  - Department of Transport and Public Works (Eastern Cape) and various municipal roads departments
  - South African National Roads Agency
  - Northern Cape Department of Agriculture Land Reform and Rural Development Civil Aviation Authority
  - Camdeboo Local Municipality
  - Cacadu District Municipality

Through consultation with key stakeholders and I&APs, issues for inclusion within the issues-based scoping study were identified and confirmed. In order to accommodate the varying needs of stakeholders and I&APs within the study area, as well as capture their views, issues and concerns regarding the project, various opportunities will be provided for I&APs to have their issues noted following the release of this Draft Scoping Report for public review. This would include:

* One-on-one consultation meetings (for example with the directly affected landowner);
* Telephonic consultation sessions (consultation with various parties from the EIA project team, including the public participation consultant, lead EIA consultant as well as specialist consultants); and
* Written, faxed or e-mail correspondence.

Networking with I&APs will continue throughout the duration of the Scoping and EIA processes.

5.3.3. Identification and Recording of Issues and Concerns

Issues and concerns raised by I&APs during the Scoping Phase will be consolidated in a **Comments and Response Report**. A finalised comments and response report incorporating all comments from the scoping phase will form part of the Final Scoping Report that will be submitted to DEA. The Comments and Response Report includes responses from members of the EIA project team and/or the project developer to either indicate how the issues will be addressed in the EIA Phase, or to provide clarification. Where issues are raised that the EIA team considers beyond the scope and purpose of this EIA process, clear reasoning for this view will be provided.

5.3.4. Evaluation of Issues Identified through the Scoping Process

Potential direct and indirect environmental impacts that are identified within the Scoping Phase have been evaluated through desk-top studies. In evaluating potential impacts, Savannah Environmental has been assisted by the following specialist consultants:

Specialist	Area of Expertise	Refer Appendix
David Hoare of David Hoare Consulting cc	Ecology, flora and fauna	Appendix F
Andrew Pearson of Endangered Wildlife Trust	Avifauna	Appendix G
Werner Marais of Animalia	Bats	Appendix H

Johan van der Waals of Terrasoil Science	Geology, soils and agricultural potential study)	Appendix I
Lourens du Plessis of MetroGIS	Visual	Appendix J
Celeste Booth of Albany Museum	Heritage / Archaeology	Appendix K
Morne de Jager of MENCO (M2 Environmental Connections cc)	Noise	Appendix L
Tony Barbour of Tony Barbour Consulting and Research	Social Impact	Appendix M

In order to evaluate issues and assign an order of priority, it was necessary to identify the characteristics of each potential issue/impact:

» *the nature,* which includes 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) or regional

The evaluation of the issues resulted in a statement regarding the potential significance of the identified issues, as well as recommendations regarding further studies required within an EIA (refer to Appendices F – M).

5.3.5. Public Review of Draft Scoping Report and Feedback Meeting

This is the current stage of the Scoping Phase. In order to facilitate comments on the Draft Scoping Report, a public meeting was held prior to the review period for the Draft Scoping Report as follows:

» **Date:** 19 January 2012
» **Time:** 17:00 -18:30
» **Venue:** Aberdeen Community Hall

The Draft Scoping Report will be made available for public review from **17 February 2012- 18 March 2012** at the following locations:

» www.savannahsa.com
» www.eskom.co.za
» Aberdeen Library- Andries Pretorius Street, Aberdeen
» Horse Shoe Library- Parsonage Street, Graaff Reinet, 6280

The public review process was advertised in local and regional newspapers i.e. the “Graaff Reinet Advertiser” (16th February 2012) and in the “Burger Oos” (14th February 2012) (refer to Appendix D). In addition, all registered I&APs were

notified of the availability of the report and public meeting by stakeholder letters (refer to Appendix E).

5.3.6. Final Scoping Report

The final stage in the Scoping Phase will entail the capturing of responses from I&APs on the Draft Scoping Report in order to refine this report. It is this final report upon which the decision-making environmental authorities provide comment, recommendations and acceptance to undertake the EIA Phase of the process.

DESCRIPTION OF THE AFFECTED ENVIRONMENT CHAPTER 6

This section of the Draft Scoping Report provides a description of the environment that may be affected by the proposed Aberdeen 200MW Wind Farm located west of Aberdeen in the Eastern Cape Province. This information is provided in order to assist the reader in understanding the possible effects of the proposed project on the environment. Aspects of the biophysical, social and economic environment that could be directly or indirectly affected by, or could affect, the proposed development have been described. This information has been sourced from both existing information available for the area as well as limited collected field data undertaken by specialists who have a working knowledge of the area, and aims to provide the context within which this EIA is being conducted. A more detailed description of each aspect of the affected environment is included within the specialist scoping reports contained within Appendices F – M of the Draft scoping report.

6.1 Regional Setting

At a broad scale the study area is located in the Camdeboo Local Municipality of the Eastern Cape Province. The study area lies ~24 km west of the town of Aberdeen in the Eastern Cape Province. The site falls within the quarter degree grids 3223BC, 3223BD, 3223DA and 3223DB. The site is located within the Camdeboo Local Municipality (EC101), which is one of 9 local municipalities that fall within the greater Cacadu District Municipality (DC10).

The Camdeboo Local Municipality is located approximately 270km from Port Elizabeth (CBD) and forms part of an area known as the “Karoo Heartland”, which defines a scenic route through the Karoo. The northern area of the study area is characterised by a mountainous terrain or high lying hinterland. The rural areas have low densities and are characterised by farming activities. The urban nodes within the municipality include:

» Graaff-Reinet, including Umasizakhe, Kroonvale, Adendorp and Kendrew;
» Aberdeen, including Lotusville and Thembalesizwe; and
» Nieu-Bethesda, including Pienaarsig.

The Camdeboo Local Municipality is renowned for its pristine natural environment, rich heritage, diverse people and cultures. Tourism is one of the key economic sectors and visitors are drawn to the area by its scenic landscapes and climate. The town of Graaff-Reinet, which is the 4th oldest town in South-Africa, is referred

to as the "Gem of the Karoo" and functions as an important service centre for the Camdeboo Local Municipality.

6.2 Location of the Study Area

The location of the proposed area for the development of the Wind Farm includes portions (parts of) of the following farms:

» Portion 3 of Sambokdoorns 92
» RE of Portion 4 of Sambokdoorns 92
» RE of Sambokdoorns 92
» Portion 1 of Klipdrift 73
» Portion 2 of Farm 94, and
» RE of Portion 2 of Farm 94.

The power line linking the facility to the grid is proposed between the site and Droërivier Substation, approximately 140 km west of the site. The assessment of the potential environmental impacts associated with this proposed power line is the subject of a separate EIA process[7].

6.3 Landuse and landcover of the study area

Landcover data for the area (Fairbanks et al. 2000) indicates that the entire site is in a natural condition (refer to Figure 6.1). The natural parts of the landscape consist primarily of "shrubland and low fynbos" (Fairbanks et al. 2000).

The Surveyor-General's 1:50 000 topocadastral maps indicate three small areas of cultivation on site. These are difficult to recognise on aerial imagery, which indicates that they are only used temporarily or no longer used at all.

[7] This EIA process is currently in the pre-application stage of the process.

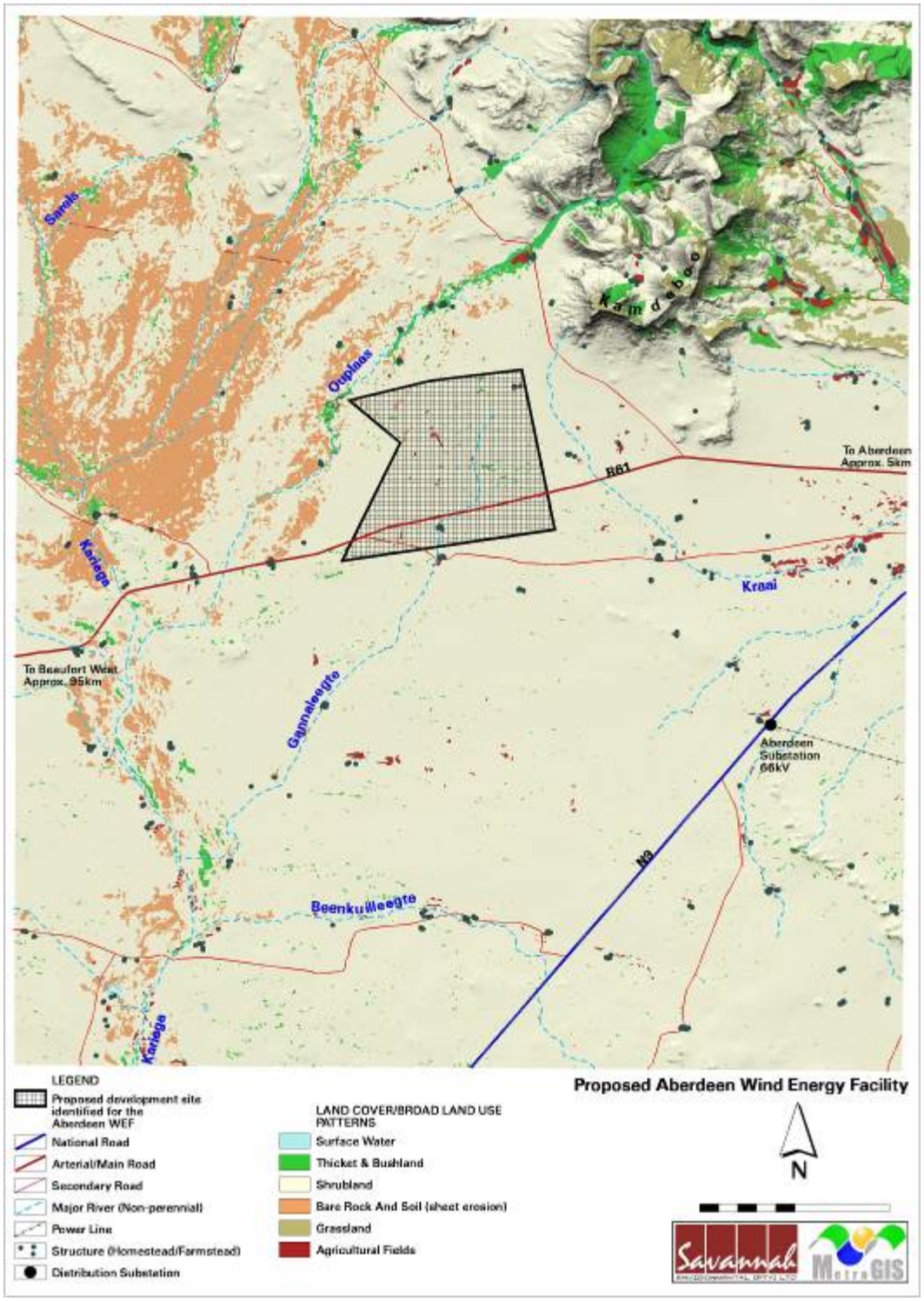


Figure 6.1: Land cover/land use map

6.4 Site access

The study area is located adjacent to the R61 road that links Aberdeen to Beaufort West. The N9 National road passes through Aberdeen. Access to the site is directly from the R61. The site is therefore well-connected to major routes in the region.

6.5 Geology and Topography

The study site is located on the flat plains south of the Great Escarpment. The Kamdebooberg is just to the north-east of the site, but the site itself is relatively flat. The elevation varies from 856 m to 936 m above sea level (refer to Figure 6.2).

Most of the site is underlain by mudstone and arenite of the Beaufort Group of the Karoo Supergroup. There is a band of dolerite running through the southern part of the site and the north-western part of the site is underlain by Quaternary age alluvial sediments consisting of calcrete and sand.

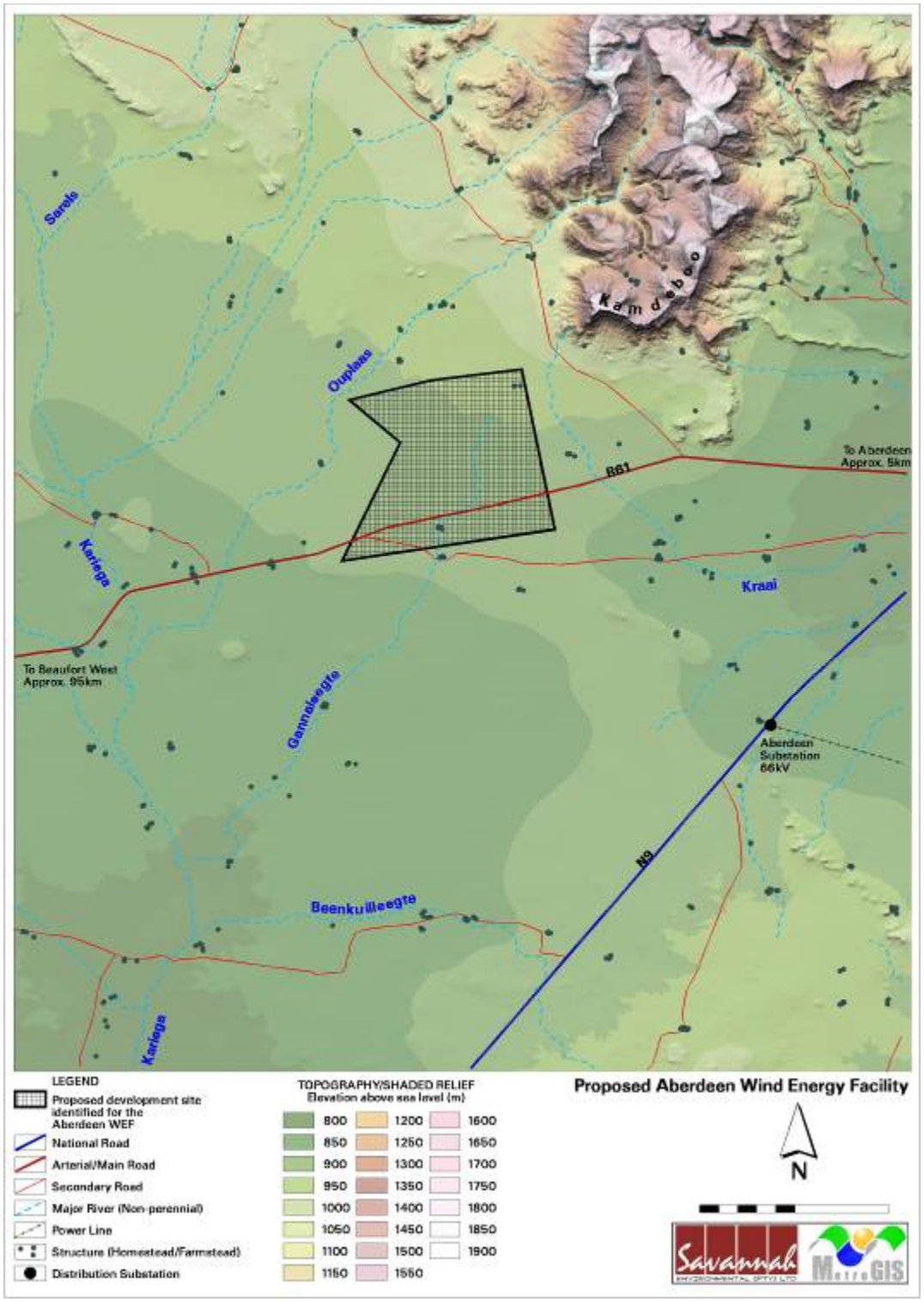


Figure 6.2: Shaded relief map (indicating the location of the proposed facility and the topography and elevation above sea level) of the study area.

6.6 Climatic Conditions

Rainfall is restricted primarily to the summer season, peaking in March. Mean temperatures are not extreme, with the mean annual temperature being approximately 17°C. Frost is a common phenomenon with up to 24 days of frost per year. Mean annual rainfall is just less than 250 mm per year. All areas with less than 400 mm rainfall are considered to be arid. The study area can therefore be considered to be arid.

6.7 Hydrology

The effect of the arid climate is that there are no perennial streams in the area. Many streams terminate in shallow lakes that dry up soon after a rainfall event. A small river, the Kraai Rivier is situated in close proximity to the site (refer to figure 6.3). There are some minor drainage lines on site that constitute very minor tributaries of the Kariega River (refer to Figure 6.4). Numerous small streams drain from the north towards the south of the site, originating in the Kamdeboo Mountains.

Figure 6.3: A crossing of the Kraai River, east of the Study site

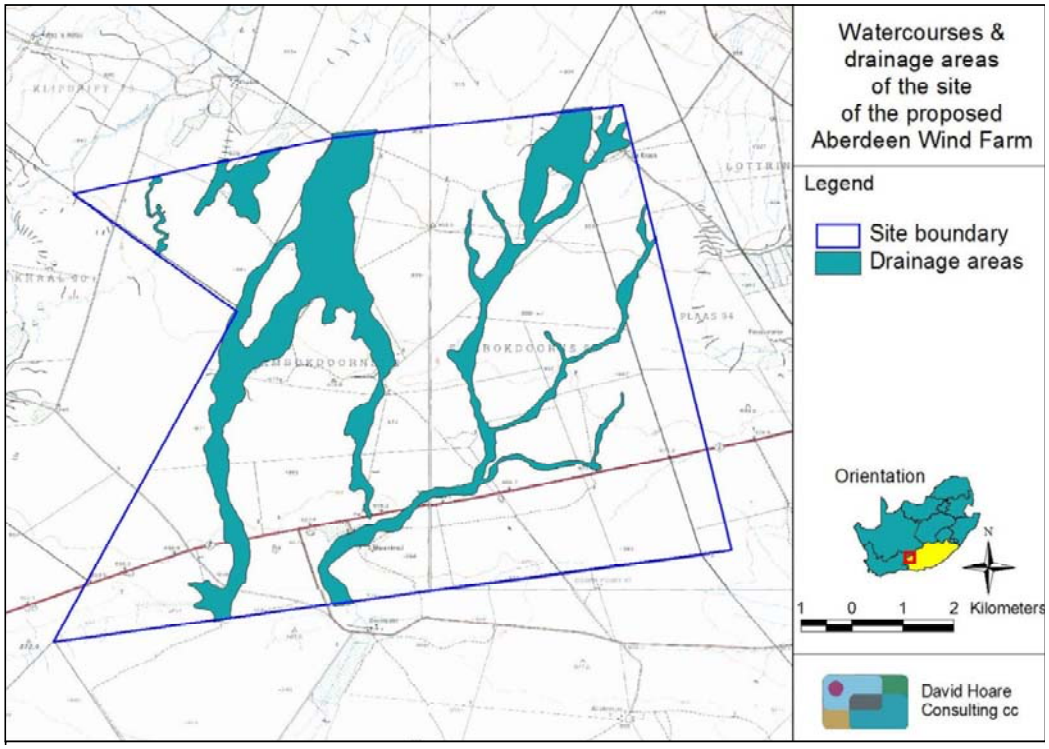


Figure 6.4: Main Water Courses of the Study site

6.8 Soil types

Detailed soil information is not available for broad areas of the country. As a surrogate, landtype data was used to provide a general description of soils in the study area (landtypes are areas with largely uniform soils, topography and climate). There are two landtypes in the study area, the Ia and Ag landtypes (Land Type Survey Staff, 1987). The site falls into the **Ag8**, **Ag9** and **Ia43** land types (Land Type Survey Staff, 1972 - 2006) (Refer to Figure 6.5 for the land type map of the area).

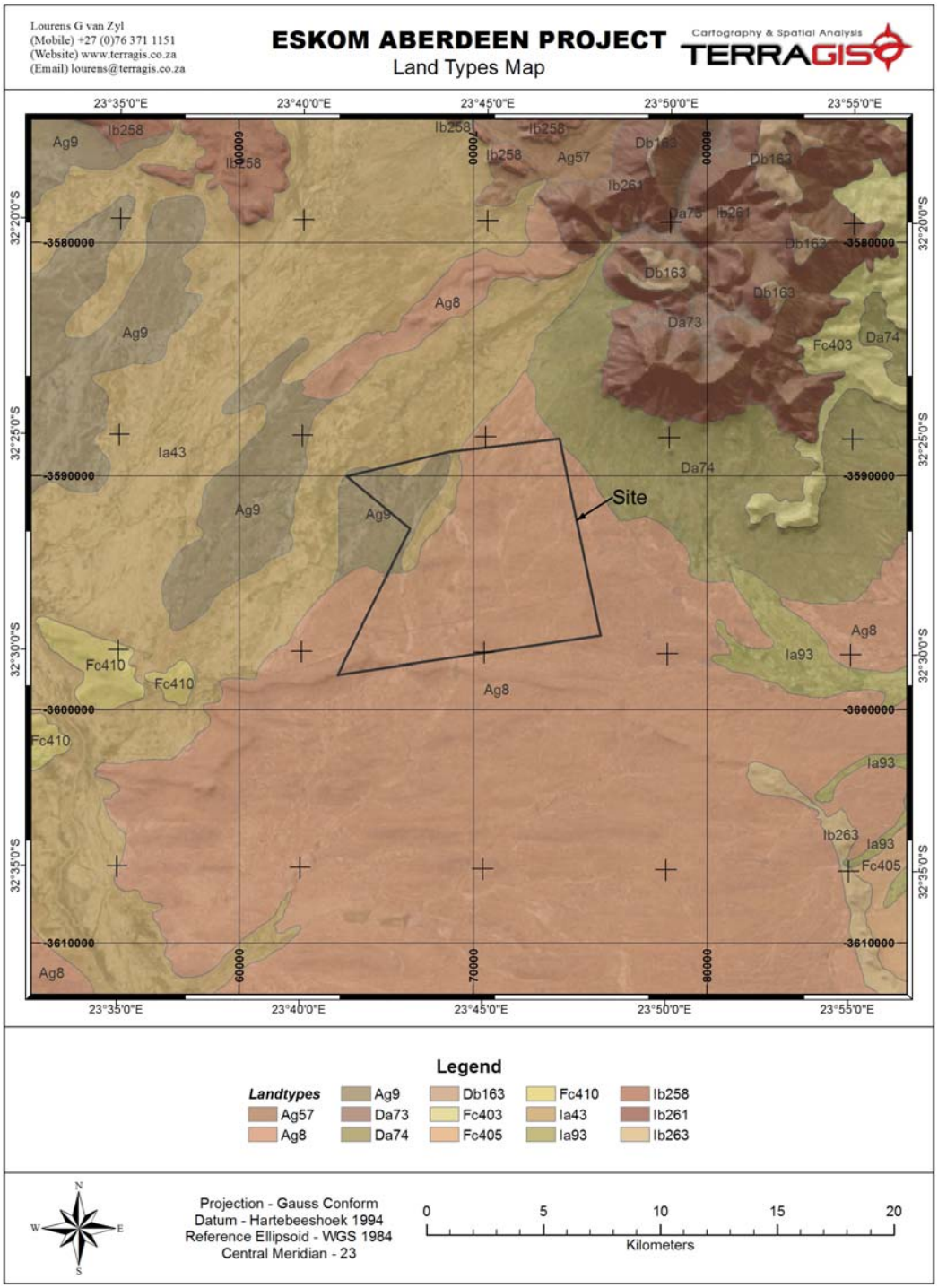


Figure 6.5: Land type map of the survey site

Land Type Ag8

Soils: Mainly shallow soils and rock outcrops with occasional occurrences of deep eutrophic and lime containing red soils. Variable depth soils with signs of incipient pedogenesis occur in drainage depressions.

Land capability and land use: Exclusively extensive grazing due to climatic and soil constraints.

Agricultural potential: Very low potential due to the low rainfall (less than 200 mm per year) and shallow soils.

Land Type Ag9

Soils: Mainly shallow soils and rock outcrops with occasional occurrences of deep eutrophic and lime containing red soils. Variable depth soils with signs of incipient pedogenesis occur in drainage depressions.
Land capability and land use: Exclusively extensive grazing due to climatic and soil constraints.
Agricultural potential: Very low potential due to the low rainfall (less than 200 mm per year) and shallow soils.

Land Type Ia43

Soils: Variable depth eutrophic and lime containing soils with signs of incipient soil formation. Structured / duplex soils occur occasionally.
Land capability and land use: Exclusively extensive grazing due to climatic and soil constraints.
Agricultural potential: Very low potential due to the low rainfall (less than 200 mm per year) and shallow soils.

6.9 Agricultural Potential

The agricultural potential of the site is very low and limited to extensive grazing due to the low rainfall and distinct soil constraints. There is only little potential to increase the agricultural potential in the form of irrigation development as the soils are generally shallow or not suited to irrigated agriculture due to inherent soil constraints. The potential for agricultural potential will have to be ascertained through detailed soil investigations. Water availability, however, is the main restricting factor and as such this type of land use is not considered viable for the site.

6.10 Ecological Profile of the Study Area

6.10.1. Vegetation

Broad Context

According to the most recent vegetation map of the country (Mucina *et al.*, 2005), the study area falls within two vegetation types, i.e. ***Eastern Lower Karoo*** and ***Southern Karoo Riviere*** (refer to Figure 6.6), both of which fall within the Nama Karoo Biome.

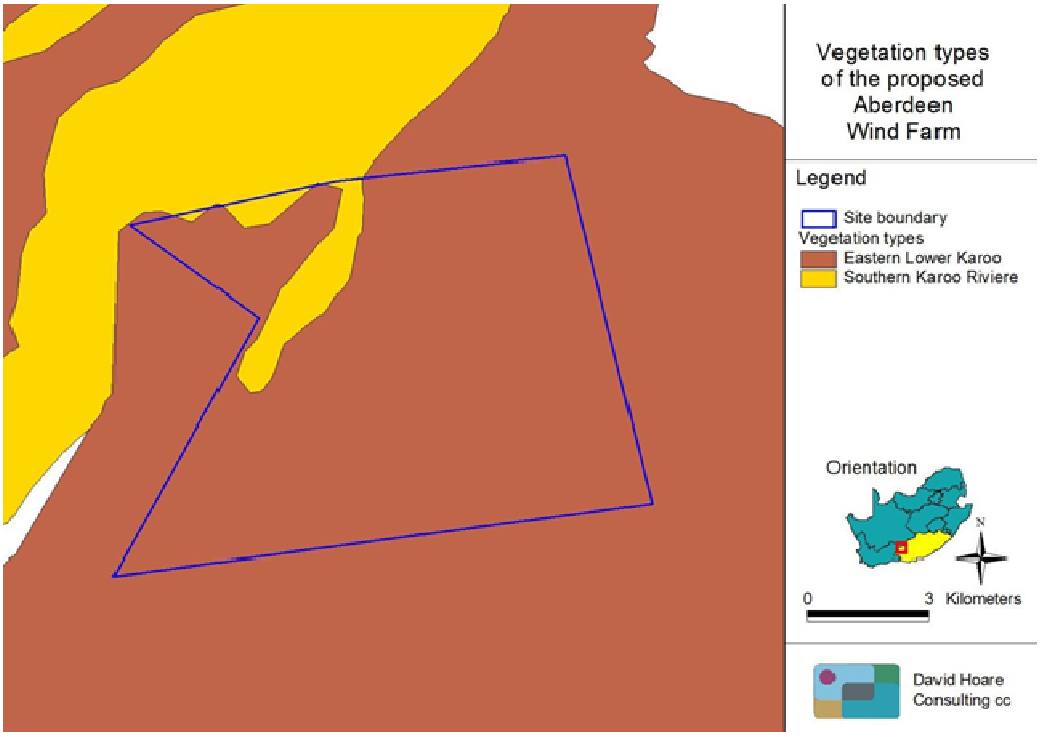


Figure 6.6: Map indicating vegetation types of the proposed Aberdeen Wind Farm

Eastern Lower Karoo is found in the Eastern Cape and Western Cape on the plains east of the Kariega and Buffels Rivers in the area south of the Kamdeboo Mountains and the line of mountains linking to the Coetzeeberge encompassing Aberdeen, Graaff-Reinet and Pearston (Mucina et al. 2006a). This landscape consists of plains interrupted by some dolerite dykes, butts and mesas. The vegetation is a low to middle-height microphyllous shrubland with drought-resistant 'white' grasses becoming abundant in places, especially on sandy and silty bottomlands. Leaf-succulent dwarf shrubs of the families Aizoaceae and Crassulaceae may also be encountered. This vegetation type is found throughout most of the site (Refer to Figure 6.6).

Southern Karoo Riviere occurs in the Eastern Cape and Western Cape on the alluvia of the Buffels, Bloed, Dwyka, Gamka, Sout, Kariega and Sundays Rivers and their tributaries, east of Laingsburg as far east as Graaff-Reinet and Jansenville (Mucina et al. 2006b). It is found on the narrow riverine flats. The vegetation is a complex of *Acacia karroo* or *Tamarix usneoides* thicket (up to 5 m tall), fringed by tall *Salsola*-dominated shrubland (up to 1.5 m tall), especially on heavier (and salt-laden) soils on very broad alluvia (Mucina et al. 2006b). In sandy drainage lines *Stipagrostis namaquensis* may occasionally also dominate. In the study area, this vegetation type is confined to a single narrow band that lies in the extreme north-western part of the site (Figure 6.6).

Conservation status of broad vegetation types

Eastern Lower Karoo is classified in Mucina *et al*. (2006) as Least threatened, with none conserved of a target of 16%, and 2% already transformed (Mucina et al. 2006). The Draft National List of Threatened Ecosystems (GN1477 of 2009), published under the National Environmental Management: Biodiversity Act (Act No. 10, 2004), does not list this vegetation type.

Southern Karoo Riviere is classified in Mucina *et al*. (2006) as Least threatened, with 3% conserved of a target of 24%, and 12% transformed (Mucina et al. 2006). The Draft National List of Threatened Ecosystems (GN1477 of 2009), published under the National Environmental Management: Biodiversity Act (Act No. 10, 2004), does not list this vegetation type.

Red List plant species of the study area

Lists of plant species previously recorded in the quarter degree grids in which the study area is situated were obtained from the South African National Biodiversity Institute. These are listed in Appendix 1 of the Ecology report (Refer to Appendix F). Additional species that could occur in similar habitats, as determined from database searches and literature sources, but have not been recorded in these grids are also listed.

Of the species that are considered to occur within the geographical area under consideration, there were two species that could occur in habitats that are available in the study area, i.e. *Boophane disticha* and *Pelargonium sidoides* both listed as widespread but Declining in terms of IUCN Ver. 3.1 (IUCN, 2001). If they occur within the study area, it is highly unlikely that loss of a relatively small area of habitat within their overall geographical range will have any effect on the conservation status of the species or population processes within these species in this general area.

Critical Biodiversity Areas (CBAs)

According to the ECBCP (Eastern Cape Biodiversity Conservation Plan), the entire site falls within a CBA2 “corridor area” (Refer to Figure 6.7). The corridor areas are important for a number of reasons, including the maintenance of ecological processes. The corridor area that contains the site appears to link the Great Escarpment to the Cape Fold Mountains to the south (Refer to Figure 6.7).

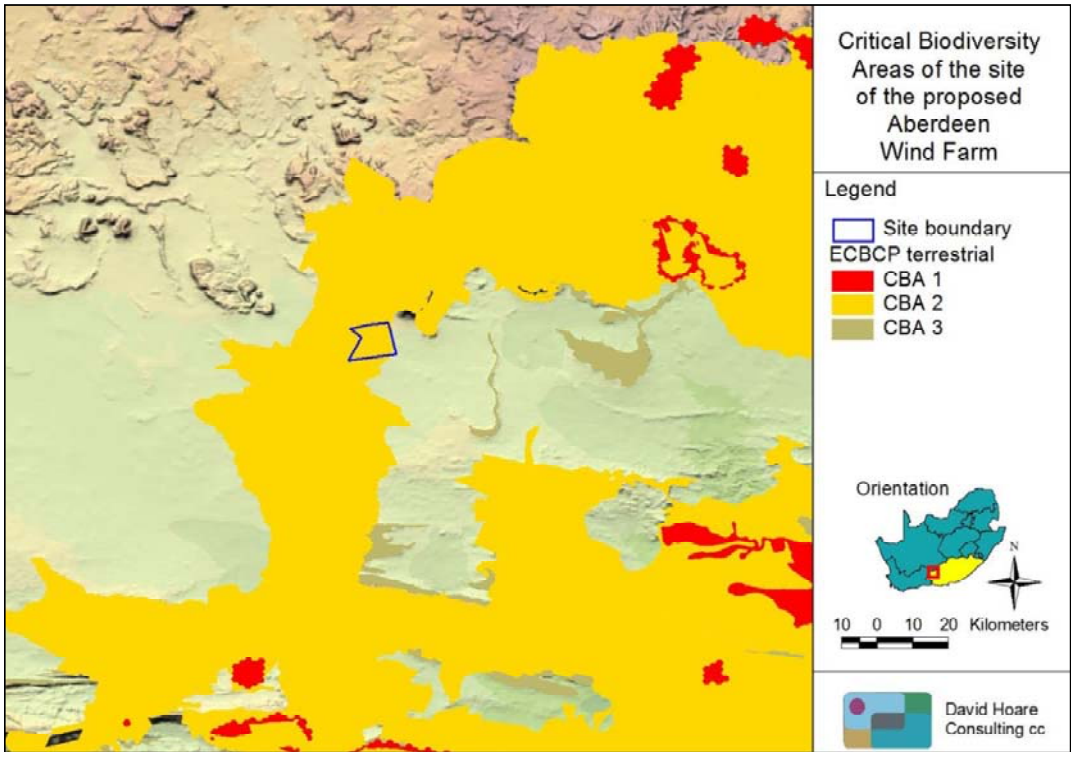


Figure 6.7 Important biodiversity areas of the study area

It should be noted that the Kamdeboo Mountain to the north-east of the site has been identified as falling within areas that are considered priority areas for the NPAES (National Protected Areas Expansion Strategy). No parts of the proposed development site or its immediate surroundings are included in a proposed park expansion area.

6.10.2. Protected Trees

Tree species protected under the National Forest Act are listed in Appendix 3 of the Ecology, flora and fauna report (Refer to Appendix F of this report). There is only one species that has a geographical distribution that includes the study area, i.e. *Podocarpus latifolius* (Real Yellowwood). This species is found in coastal and Afromontane forest, which does not occur on site or nearby. It is therefore considered that there is no probability of protected trees occurring on the proposed site.

6.10.3. Terrestrial Fauna

There is one **reptile** species of conservation concern that has a distribution that includes the study area and which could occur on site, the Namaqua Plated Lizard (Near Threatened). This species is found in dry sandy areas, bare rocky hillsides and in *Acacia* scrub.

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

In summary, the animal species of conservation concern that could potentially occur on site are as follows:

» Namaqua Plated Lizard (NT),
» Giant Bullfrog (NT),

6.10.4. Bats

The proposed development site displays a possibility of two of the three factors necessary for bat occurrence, namely the possibility of seasonal surface water and probability of insects due to surface water and streams, suggesting that it is likely to have a higher bat activity in the areas where the most moisture will be available. From Table 6.1, it can be concluded that special attention needs to be given to the possible presence of *Rhinolophus capensis* and *Miniopterus natalensis*.

Table 6.1: Table of species that may be roosting or foraging in the proposed study area, the possible area specific roosts, and their probability of occurrence. [*LC = Least Concern; NT = Near Threatened; V = Vulnerable (Monadjem *et al.*, 2010)].

Species	Common name	Probability of occurrence	Conservation status	Possible roosting habitat to be utilised on study area
Rhinolophus capensis	Cape horseshoe bat	Medium	NT	Roosts gregariously in caves, no known caves close to the study site. But associated with Karoo succulents and suitable hollows which may be present.
Rhinolophus clivosus	Geoffroy's horseshoe bat	Medium	LC	Roosts gregariously in caves and rock hollows. Suitable hollows may be present. no known caves close to the study site.
Rhinolophus darlingi	Darling's Horseshoe bat	Low	LC	On border of distribution. Roosts gregariously in caves and rock hollows.

Species	Common name	Probability of occurrence	Conservation status	Possible roosting habitat to be utilised on study area
				Suitable hollows may be present. no known caves close to the study site.
Nycteris thebaica	Egyptian Slit-faced bat	High	LC	Roosts in any suitable hollows such as culverts, burrows and manmade hollow structures.
Tadarida aegyptiaca	Egyptian free-tailed bat	High	LC	Crevices, buildings, rock crevices in mountainous area.
Miniopterus natalensis	Natal long-fingered bat	Medium	NT	Roosts gregariously in caves, no known caves close to the study site.
Eptesicus hottentotus	Long-tailed serotine	High	LC	Crevice dweller and in buildings and caves/rock hollows. no known caves close to the study site. Some farm buildings in north eastern corner of site, and at southern boundary.
Myotis tricolor	Temmink's Myotis	Medium	LC	Roost in small hollows and caves. no known caves close to the study site.
Neoromicia capensis	Cape Serotine bat	High	LC	Roofs of buildings, bark of large exotic trees at farm buildings in north eastern corner of site, very common species.

Additionally the Kamdeboo Mountains to the north east of the site can offer a multitude of roosting space for bats that have a high probability of foraging down the valleys and drainage gulleys of the waterways draining from the mountains. Therefore the water ways and area forming part of the Southern Karoo Riviere vegetation unit can act as important bat foraging corridors.

6.10.5. Avifauna

Red Data bird species recorded in the four quarter degree squares covering the study area by the Southern African Bird Atlas Project (Harrison et al, 1997) are included within the Avifauna Specialist report (refer to Appendix G). In total 9 Red Data species were recorded, comprising 5 Vulnerable and 4 Near-threatened species.

Of these, the Blue Crane, Kori Bustard, Ludwig's Bustard, Secretary bird and White Stork[8] are species with relatively high recorded abundance in the area. These species have all proven vulnerable to collision with other obstacles such as power lines. International experience has shown that medium to large raptors are particularly vulnerable to collision with wind turbine blades, and therefore both Martial Eagle Black Harrier become important species for this study (even though both have a relatively low report rates).

In summer, White Stork is abundant in the Eastern Cape Karoo Precinct. Blue Crane is present in summer and winter, while Ludwig's Bustard show's higher densities in winter. This route has also recorded Kori Bustard, Secretary bird, Southern Black Korhaan and Karoo Korhaan.

The resultant list of important species within the study area includes:

» Martial Eagle,
» Lesser Kestrel,
» Rock Kestrel,
» Black Harrier,
» Ludwig's Bustard,
» Blue Crane,
» Secretary Bird and
» White Stork.

6.11. Heritage Profile

No systematic archaeological research has been conducted within this region of the Eastern Cape, therefore little is known about the archaeology of the immediate area proposed for the Aberdeen Wind Energy Facility. The Albany Museum holds records of sites recorded mainly to the east of Aberdeen and closer to Graaff-Reinet, approximately 75 km to the east of Aberdeen. These are mainly rock art sites and open site scatters of stone artefacts in association with some other organic and material archaeological remains. However, one rock engraving, burials and historical buildings have also been recorded. The closest archaeological site in proximity to the proposed area for development that has been recorded is a rock shelter containing rock paintings, situated approximately 40 km to the east, past Aberdeen. A farm situated approximately 70 km to the north-west of the proposed area has been noted to contain about six to eight Later Stone Age sites including rock shelters with rock paintings. A number of rock engravings have been recorded and published in and around the Beaufort

[8] The White Stork is included as it is protected internationally under the "Bonn Convention on migratory species"

West area, within approximately 114 km to the west along the R61 (Parkington *et al.* 2008) and recently, various Middle Stone, Later Stone Age, rock shelters, and rock engravings have been recorded about 75 km to the north on a site about 34 km south of Victoria West (Binneman *et al.* 2011a).

6.12 Social Characteristics of the Study Area and Surrounds

6.12.1. Provincial Socio- Economic Overview

The proposed Aberdeen Wind Farm is located within the Cacadu District Municipality of the Eastern Cape Province of South Africa. The Eastern Cape Province is the second largest province in terms of land area in South Africa (169 580 km^2) and makes up 13.9% of South Africa's total land area. The province contributes 7.5 % to the countries total GDP (Growth and Development Programme) and with 14.1 % of South Africa's population it is the country's third most populous province. With the exception of the Nelson Mandela Metro and Buffalo City, the province is predominantly rural in character.

The Eastern Cape is also the poorest province in South Africa. The high levels of poverty in the province are linked to the inclusion of the two former apartheid era Bantustan areas, namely the Transkei and Ciskei, into the Eastern Cape (Austrian Development Agency, 2005). In terms of unemployment rates, the OR Tambo and Alfred Nzo Districts have the highest rates, followed by Chris Hani and Amatole. All of these districts have unemployment rates higher than the provincial average. The Cacadu District Municipality (within which the site is located) has the lowest unemployment rate in the province.

6.12.2. Population

Based on the 2001 Census Statistics, the Camdeboo Local Municipality (CLM) had a population of 44 370 in 2001 made up of approximately 10 320 households, giving an average of 4.3 people per house. During 2007 StatsSA conducted a national Community Survey based on random samples taken throughout the country. The findings of the survey released in 2008 indicated that the population of the Camdeboo Local Municipality was 41 764 compared to the 44 370 in 2001, i.e. a decrease in the population. The Camdeboo Local Municipality Integrated Development Plan (IDP) states that the data from the Community Survey is deemed to be unreliable. Based on current estimates the population of the Camdeboo Local Municipality is estimated to be in the region of 50 000 (CLM IDP 2007-2012).

Of the 2001 total, ~ 67 % were Coloureds, 22 % Black African and 11 % Whites. The dominant language in the area is Afrikaans. In terms of settlements, the largest concentration of people live in Graff-Reinet (24 224), followed by

Umasizake (8 237), Aberdeen (4 976), Thembalesizwe (1 345), Nieu-Bethesda (1 009). Approximately 4 579 live in the rural, farming areas of the Local Municipality (Census 2001).

6.12.3. Education

Based on the 2001 Census data ~ 50% of population older than 20 years are semi- or completely illiterate, whilst the majority of the remaining 50% do not have secondary, matric or a higher qualification. In this regard ~ 6% of persons older than 20 years have a tertiary education. Due to the low education levels a large number of persons are employed as general labourers, and have to perform menial tasks with limited responsibility (CLM IDP 2007-2012). Youth development and education have therefore been identified a key priorities by the Camdeboo Local Municipality.

6.12.4. Household Incomes

Census 2001 data indicated that of the ~ 10 320 households in the Camdeboo, 39% earned below R800 per month and 43 % earned between R801 and R3 200 per month. At the time of the Census, the Poverty Line Income was defined as R800 per month per household. The Department of Social Welfare classifies a household as indigent and living below the poverty line if it has an income of up to R9 600 per year, which is R800 per month. The low income levels in the area are closely linked to the low education levels.

As a result of the low income levels a large portion of the population derives its income from Social Support (Welfare). Based on latest statistics (2010) 42% of the total population (50 000) receive some form of social support from the Government. In terms of totals, a total of ~ R 194 million is paid out per annum in social grants. Of this total, Child Support Grants make up 50% of Grants & Pensions paid out in the Camdeboo Local Municipality. This total is expected to increase as the age threshold is moved up (CLM IDP 2007-2012).

6.12.5. Employment

According to the 2001 National Census, 20% of the employable sector was unemployed and 43% were not economically active. Of the Employable Sector (age group 15-65 years), 37% was employed; of those 71% worked in the Formal Sector, 12% in the Informal Sector and 18% in the Farming (Agricultural) Sector. Recent figures for the area indicate that in 2008 the level of unemployment had risen to 25% compared to the 2001 level of 20%. This is the same as the National Unemployment rate for 1st Quarter of 2011 (25%).

6.12.6. Basic Services

The 2001 Census data indicated that an average of 98.7% of households in the Camdeboo Local Municipality had access to piped water within 200 m from their dwelling. In terms of sanitation, ~ 89.7% of households had access to a minimum of a VIP (Ventilated Improved Pit) pit latrine, while ~ an average of 92.5% of households had access to weekly refuse collection. With regard to electricity, ~ 93.4% of all households had access to electricity. In 2004 ESKOM reported that there were no electrification infrastructure backlogs within Camdeboo Local Municipality. The level of basic services in the Camdeboo Local Municipality is therefore regarded as good.

6.12.7 Road Infrastructure

The Integrated Development Plan (IDP) notes that tourism is one of the main economic drivers in the Camdeboo Local Municipality and it is therefore crucial that roads, signage and markings be of acceptable standard and are maintained properly. The IDP indicates that many rural gravel roads throughout the District are in a very poor state of repair.

SCOPE OF THE WIND ENERGY FACILITY PROJECT CHAPTER 7

This chapter provides details regarding the scope of the proposed Aberdeen Wind Energy Facility, including all required elements of the project and necessary steps for the project to proceed. The scope of the project includes construction, operation and decommissioning activities. This chapter also describes alternative options with regards to the proposed wind energy facility development, including the "do nothing" option.

7.1. Project Alternatives

Through the regional assessment site identification and selection process, Eskom were guided to site/locate their proposed wind farm within an area/zone of preference (the site selection process undertaken is described in detail in Chapter 4). This site identification process is considered acceptable by DEA and therefore no location/site alternatives are required to be considered further. The following project alternatives, however, will be investigated in the EIA:

» **The 'do nothing' alternative:** Eskom does not establish a wind energy facility west of Aberdeen in the Eastern Cape (maintain status quo). This option would result in no impacts on the environment as a result of a wind farm in this area. It will however also result in the opportunity to introduce up to 200MW of renewable energy into the Eskom energy mix and avoid Greenhouse Gases and particulates emissions being lost. This alternative will be assessed in the EIA phase of the process.

» **Site-specific alternatives:** in terms of turbine positions within the broader study area of 8 198 ha. Once sufficient information is available from an environmental and planning perspective for the broader 8 198 ha site, a detailed micro-siting exercise will be undertaken to effectively 'design' the wind energy facility. As local level issues were not assessed in sufficient detail at the regional level, these issues are now being considered within the site-specific studies and assessments through the EIA in order to delineate areas of sensitivity within the broader area. Through the process of determining environmental constraining factors, the layout of the wind turbines and infrastructure can be appropriately planned. The overall aim of the planning process would be to maximise electricity production through exposure to the wind resource, while minimising infrastructure, operation and maintenance costs, and social and environmental impacts. Specialist software is available to assist developers in selecting the optimum position for each turbine. This micro-siting information will then be provided, and will inform the specialist impact assessments at the EIA phase. The planning

process will also include the positioning of other ancillary infrastructure, including access roads, laydown areas and substation sites.

Feasible alternatives in this regard will be assessed in detail in the EIA phase.

» **Alternative technologies:** for use in the establishment of the wind facility. There is a limited range of alternative technologies (wind turbines) for commercial scale wind energy facilities. In addition, the technology is constantly evolving. Table 7.1 summarises the types of variables associated with existing wind turbine technologies. There are no significant differences from an environmental perspective between technologies. Eskom will embark on a competitive bidding process (i.e. call for bids from suppliers) to arrive at the most cost-effective, yet environmentally responsible, solution for the site based on the measured wind resource and any identified constraining factors.

Table 7.1: Alternative Wind Turbine Technologies

Variables	Types of Technologies
Type	The horizontal axis wind turbine completely dominates the commercial scale wind turbine market.
Size	Typical land-based utility scale wind turbines are in the 600 kW to 5 MW range.
Foundation	The foundation is usually poured concrete. Its size and shape is dictated by the size of the wind turbine and geotechnical considerations.
Tower	Tubular steel towers are generally standard, although other materials could be used for this purpose. The height of towers for larger commercial turbines (1,5 MW – 5MW) generally varies between 80 m and 140 m.
Rotor	3- bladed rotor is standard.
Rotor Speed Control	Fixed or variable speed rotors
Gears	Geared and Gearless ('direct or indirect drives')
Generator	Standard high speed generator (geared) or custom low-speed ring generator (gearless)
Other variables	Yaw gears, brakes, control systems, lubrication systems and all other turbine components are similar on modern wind turbines

» **Transportation Route Alternatives:** for transportation of all components associated with the project to the site. Aberdeen may be accessed from the R61 road that links Aberdeen to Beaufort West. The N9 National road passes through Aberdeen. The various transportation options (harbour, rail, air, road), as well as the possible routes associated with these options will be further assessed through a transportation study to be undertaken by Eskom. The results of this study will be included within the EIA.

» **Alternative materials for road construction:** Borrow material will be as first option procured from commercial sources and as second option recovered within Eskom's site.

7.2. Project Construction Phase

In order to construct the proposed wind farm and associated infrastructure, a series of activities will need to be undertaken. The erection and commissioning of the turbines will be completed in a phased approach, as this facility lends itself to phased-construction i.e. the project can split into two 100 MW phases. It is proposed that the facility will have a capacity of approximately 200 MW (i.e. in the order up to 150 industry-standard turbines). The construction phase for erection of approximately 100 wind turbines as well as the required associated infrastructure is expected to take between 24 and 36 months.

It is expected that at peak of construction there will be between 200 and 350 people in a construction crew, depending on the construction phase of project and the nature of activities being undertaken. There may be more than one crew operating on the site at any one time. Construction crews will constitute mainly skilled and semi-skilled workers. No employees will reside on the site at any time during the construction or operational phases.

The following construction activities have been considered to form part of the project scope of the Eskom Aberdeen 200MW Wind Farm in the Eastern Cape.

7.2.1. 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 on-site substation site/s. The survey of the power line servitude/s to determine tower locations will be undertaken and assessed in a separate EIA process.

7.2.2 Establishment of Access Roads to the Site

The proposed site is essentially only accessible from the R61 (the study area is located adjacent to the R61 road that links Aberdeen to Beaufort West, the R61 also cuts through the site across the southern portion) and the R0599 (gravel road between Aberdeen and Murraysburg). Access/haul roads to the site (if required) as well as internal access roads within the site are required to be established prior to the commencement of construction. Access to the site is likely to be from the R61 or R0599. As far as possible, existing access roads would be utilised, and upgraded where required. Within the site itself, access will be required between the turbines for construction purposes (and later limited

access for maintenance). Special haul roads of up to 13m in width may need to be constructed to and within the site to accommodate abnormally loaded vehicle access and circulation. The internal service road alignment will be informed by the final micro-siting/positioning of the wind turbines.

These access roads will have to be constructed in advance of any components being delivered to site, and will remain in place after completion for future access and possibly access for replacement of parts if necessary. It is proposed that in preparing the access road, a portion of it (up to 6m in width) will be constructed as a permanent access road and the remainder as a temporary access road that can be de-compacted and returned to its pre-construction condition.

7.2.3. Undertake Site Preparation

Site preparation activities will include clearance of vegetation at the footprint of each turbine, the establishment of internal access roads (as discussed in 7.2.2 above) and excavations for foundations (refer to 7.2.4 below). 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).

7.2.4 Construct Foundation

Concrete foundations will be constructed at each turbine location. Foundation holes will be mechanically excavated to a depth of approximately 2 m.

Figure 7.1: Photograph illustrating the construction of the foundation of one of the turbines at the Klipheuwel demonstration facility (photo courtesy of Eskom)

Concrete will be batched at an appropriate location on-site. The reinforced concrete foundation of approximately 25 m x 25 m x 2 m will be poured and support a mounting ring. The foundation will then be left up to a week to cure. If the geological conditions dictate, the use of alternative foundations will be considered (e.g. reinforced piles).

7.2.5. Transport of Components and Equipment to Site

The wind turbine, including tower, will be brought on site by the supplier in sections on flatbed trucks. Turbine units which must be transported to site consist of a tower (comprised of segments), a nacelle weighing approximately 83 tons, and three rotor blades (each of up to 70 m in length). The individual components are defined as abnormal loads in terms of Road Traffic Act (Act No 29 of 1989)[9] by virtue of the dimensional limitations (abnormal length of the 70 m blades) and load limitations (i.e. the nacelle).

[9] A permit may be required for the transportation of these loads on public roads.

Figure 7.2: Photograph illustrating the equipment required for the transportation of turbine components to site (photographs courtesy of Eskom at during the construction of the Klipheuwel demonstration facility)

In addition, components of various specialised construction, lifting equipment and counter weights etc. are required on site to erect the wind turbines and need to be transported to site. In addition to the specialised lifting equipment, 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 mixers, etc.).

The components required for the establishment of the substation (including transformers) as well as the power line (including towers and cabling) will also be transported to site as required.

The dimensional requirements of the load during the construction phase (length/height) may require alterations to the existing road infrastructure (widening on corners, removal of traffic islands), accommodation of street furniture (electricity, street lighting, traffic signals, telephone lines etc.) and protection of road-related structures (bridges, culverts, portal culverts, retaining walls etc.) as a result of abnormal loading.

The equipment will be transported to the site using appropriate National and Provincial routes, and the dedicated access/haul road to the site itself. The transportation study to be undertaken by Eskom will deal with external roads in this regard.

7.2.6. Establishment of Lay Down Areas on Site

Lay down areas will need to be established at each turbine position for the storage of wind turbine components. The lay down area will need to accommodate the cranes required in tower/turbine assembly. Lay down and storage areas will be required to be established for the normal civil engineering construction equipment which will be required on site.

A large lay down area (approximately 20 m wide x 150 m long) will be required at each position where the main lifting crawler crane may be required to be erected and/or disassembled. This area would be required to be compacted and levelled to accommodate the assembly crane, which would need to access the crawler crane from all sides.

7.2.7. Construct Turbine

A large lifting crane will be brought on site. It will 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. The next step will be to assemble or partially assemble the rotor (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.

The wind turbine which will be utilised at the Aberdeen 200MW Wind Farm in the Eastern Cape is likely to have a hub height of up to 140m and a rotor diameter of up to 140m (i.e. each blade being up to 65m in length and nacelle up to 10m in diameter). It is proposed to construct between 150 and 200 turbines appropriately spaced within the study area to make optimum use of the available wind resource. Turbines will be appropriately spaced to minimise wake effects and wind turbulence.

The lifting cranes will be required to move between the turbine sites. The crawler crane is self-powered and can “crawl” between locations should the ground conditions allow. When assembled, the crawler crane has a track width of approximately 11 m.

Figure 7.3: Photograph illustrating the assembly of a turbine tower utilising a large lifting crane (photographs courtesy of Eskom taken during the construction of the Klipheuwel demonstration facility)

Figure 7.4: Photograph illustrating the assembly of a turbine (nacelle and blades) utilising a large lifting crane (photographs courtesy of Eskom from construction at the Klipheuwel demonstration facility)

7.2.8. Construct On-site Substation/s

One or more substations will be constructed within the site. The turbines will be connected to the on-site substation/s via underground 33 kV cabling (refer to 7.2.9 below). The position of the substation (or substations) will be informed by the final micro-siting/positioning of the wind turbines. The layout of the turbines will determine the optimum position for the construction of a substation. The substation/s will be constructed with a high-voltage (HV) yard footprint of up to 80 m x 80 m.

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

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

7.2.9. Establishment of Ancillary Infrastructure

A small office structure and visitors centre may also be constructed at the entrance to the wind energy facility. These structures would occupy a footprint of about 800 m^2. The establishment of these buildings will require the clearing of vegetation and levelling of the development site and the excavation of foundations prior to construction. A lay down area for building materials and equipment associated with these buildings will also be required.

7.2.10. Connection of Wind Turbines to the On-site Substation

Each wind turbine will be connected to an optimally positioned substation by underground electrical cables though a collection system (this is when the electrical cables are 'collected' in a bundle from the turbines to the substation). The installation of these cables will require the excavation of trenches, approximately 1 m in depth within which these cables can then be laid. The underground cables will be planned to follow the internal access roads, where possible.

7.2.11. Connect Substation/s to Power Grid

A proposed 400 kV power line will connect the substation/s to the electricity distribution network/grid at the Droërivier Substation which lies approximately 140 km west of the proposed development site. The connection point to the Eskom power grid will be confirmed through a network planning exercise. A route for the power line will be assessed, surveyed and pegged prior to construction.

The power line will be constructed utilising appropriate 400kV towers and will be approximately 35 m in height. A servitude of approximately 55 m will be required for this power line.

A separate EIA process will be undertaken for the assessment of the proposed power line that connects the on-site substation to the power grid.

7.2.12. Commissioning

Prior to the start up of a wind turbine, a series of checks and tests will be carried out. This will include both static and dynamic tests to make sure the turbine is working within appropriate limits. Grid interconnection and unit synchronisation will be undertaken to confirm the turbine and unit performance. Physical adjustments may be needed such as changing the pitch of the blades. The schedule for this activity will be subject to site and weather conditions.

7.2.13. Undertake Site Rehabilitation

As construction is completed in an area, and as all construction equipment is removed from the site, the site will be rehabilitated where practical and reasonable. On full commissioning of the facility, any access points to the site which are not required during the operation phase will be closed and rehabilitated. Due to the mobility of the sandy soils, and as rehabilitation and recovery of vegetation on the site will be slow, rehabilitation activities will (as far as possible) commence at each turbine location once construction of that particular turbine is completed.

7.3. Project Operation Phase

Once operational, the wind energy facility will be monitored locally and remotely. It is estimated that the operational phase of the project will provide employment for approximately 15 skilled staff members, who will be responsible for monitoring and maintenance when required. It is most likely that the facility will be manned by the appointed operations and maintenance staff.

Each turbine within the wind energy facility will be operational except under circumstances of mechanical breakdown, extreme weather conditions or maintenance activities. The following operation activities have been considered to form part of the project scope of the Aberdeen 200MW Wind Farm in the Eastern Cape.

7.3.1. Maintenance

The wind turbine will be subject to periodic maintenance and inspection. Periodic oil changes will be required. Any waste products (e.g. oil) will be disposed of in accordance with relevant waste management legislation.

7.4. Decommissioning

The turbine infrastructure which will be utilised for the proposed Aberdeen 200MW Wind Farm is expected to have a lifespan of approximately 20 - 30 years (with maintenance). Equipment associated with this facility would only be decommissioned once it has reached the end of its economic life. It is most likely that refurbishment of the infrastructure of the facility discussed in this EIA would comprise the disassembly and replacement of the turbines with more appropriate technology/infrastructure available at that time.

The following decommissioning activities have been considered to form part of the project scope of the proposed Wind Farm.

7.4.1. Site Preparation

Site preparation activities will include confirming the integrity of the access to the site to accommodate required equipment and lifting cranes, preparation of the site (e.g. lay down areas, construction platform) and the mobilisation of decommissioning equipment.

7.4.2. Disassemble Existing Turbine

A large crane will be brought on site. It will be used to disassemble the turbine and tower sections. These components will be reused, recycled or disposed of in accordance with regulatory requirements. All parts of the turbine would be considered reusable or recyclable except for the blades.

SCOPING OF ISSUES ASSOCIATED WITH THE ABERDEEN 200MW WIND FARM CHAPTER 8

Construction activities for wind energy projects typically include:

» land clearing for site preparation and access routes;
» transportation of supply materials and fuels;
» construction of foundations involving excavations and placement of concrete;
» construction of a substation, underground and above ground power lines
» operating cranes for unloading and installation of equipment;
» commissioning of new equipment, and
» waste removal and rehabilitation of disturbed sites

Operational activities include regular maintenance of the site infrastructure.

Decommissioning activities may include removal of project infrastructure and site rehabilitation.

Environmental issues associated with construction and decommissioning activities may include, among others, noise impacts, heritage impacts, soil erosion, and threats to biodiversity and ecological processes, including habitat alteration and impacts to wildlife.

Environmental issues specific to the **operation** of a wind farm could include visual impacts; noise produced by the spinning of rotor blades; avian/bat mortality resulting from collisions with blades; and mortality, injury and disturbance to other faunal species.

The significance of impacts associated with a particular wind farm is dependant on site-specific factors, and therefore impacts can be expected to vary significantly from site to site.

The environmental issues associated with all phases of the proposed Aberdeen 200MW Wind Farm have been identified through a scoping evaluation undertaken in accordance with the requirements of the EIA Regulations. This chapter serves to describe and evaluate the identified potential environmental impacts associated with the wind farm project, and to make recommendations for further studies required to be undertaken in the EIA phase, and/or recommendations for the management of these impacts through inclusion in the Environmental Management Programme (EMP).

Section 8.1 and 8.2 provide a summary of the findings of the scoping study undertaken for the construction and operation phases of the proposed wind farm project respectively. Impacts associated with decommissioning are expected to be similar to those associated with construction. Potential direct and indirect impacts of the proposed wind farm are evaluated, and recommendations are made regarding further studies required within the EIA phase of the process. Specialist scoping reports are included within Appendix F to M.

In identifying and evaluating impacts associated with the proposed project, it has been assumed that although during the **operational phase** the area affected will be limited and comprise between 100 and 150 wind turbines in total (with a hub height of up to 140m each), access roads and a substation footprint, during **construction** a larger area within the approximately 8 198 ha area being considered for the wind farm footprint could suffer some level of disturbance as a result of the required activities on site. However, once construction is complete, only a small portion of this area (typically less than 10%) will be permanently impacted by infrastructure associated with the wind farm.

The **cumulative impacts** associated with the proposed wind farm are expected to be associated with the scale of the project, i.e. between 100 and 150 wind turbines will be located on the proposed site, as well as within the proximity of this proposed wind farm to other proposed wind farms to be constructed in the larger study area. The potential direct cumulative impacts associated with the project are expected to be associated predominantly with the potential visual impact, potential noise impacts, potential vegetation impact, potential heritage impact and potential impacts on birds and bats in the surrounding area. Cumulative effects can only be assessed once a preliminary layout is available, and will be considered in the detailed specialist studies to be undertaken in the EIA phase of the process.

It must be noted that the draft scoping report is mainly a desktop study undertaken by specialists, and all potential impacts identified through the scoping phase (indicated as being of low to high significance) will be further assessed and confirmed during the EIA phase. Some specialists have however conducted site visits to support their reports.

8.1. Evaluation of potential impacts associated with the CONSTRUCTION PHASE of the proposed Aberdeen 200MW Wind Farm north-west of Aberdeen

Potential Visual Impacts:

Potential visual impacts during the construction phase on observers in close proximity to the wind farm and power line[17] are expected to be:

» of a short duration and

» limited to an area in close proximity to the site.

Issue	Nature of Impact	Extent of Impact	'No go' areas
Potential visual impacts associated with the construction phase on observers in close proximity to the facility.	Construction of the wind farm.	Local[18]	None identified to date
The potential visual impact of the construction of ancillary infrastructure (i.e. the substation at the facility, access road to the site, internal access roads within the site, etc. as required) on observers residing in close proximity of the facility.	Construction of associated infrastructure of the wind farm.	Local	None identified to date

Gaps in knowledge & recommendations for further study:

Impacts are expected to be of moderate to low significance and will therefore require a detailed assessment in the EIA phase to get a better understanding of the implications associated with all potential impacts.

[17] To be assessed as part of a separate EIA process

[18] Limited to the immediate area or site of development.

Potential Impacts on Agricultural potential:

The agricultural potential of the site is very low and limited to extensive grazing due to the low rainfall and distinct soil constraints. There is only little potential to increase the agricultural potential in the form of irrigation development as the soils are generally shallow or not suited to irrigated agriculture due to inherent soil constraints. The potential for irrigation will have to be ascertained through detailed soil investigations. Water availability, however, is the main restricting factor and as such this type of land use is not considered viable for the site.

Issue	Nature of Impact	Extent of Impact	'No go' areas
Loss of agricultural land	Construction of proposed Wind farm and associated infrastructure	Local in terms of the activity and will be associated with the activity only. Impacts are expected if storm water runoff is not controlled through the loss of topsoil. The impacts are considered to be of low significance due to the low agricultural potential of the site	None identified to date

Gaps in knowledge & recommendations for further study:

The significance of the project on agriculture (if any) will be assessed in the EIA phase. Specific requirements of the Department of Agriculture for this type of development will be addressed (refer to Agricultural potential impact assessment – Appendix I).

Potential Impacts on Soil and current Land Use:

Due to the low rainfall, impacts on the soils such as erosion and dust generation are considered potentially problematic during the construction phase and will have to be addressed in more detail during the EIA phase. At present there are no preferences for the placement of the turbines as the impacts are considered to be similar throughout the site. This situation can change once the detailed investigation has been conducted.

Issue	Nature of Impact	Extent of Impact	'No go' areas
Soil degradation	Damage of topsoil due to construction activity (excavation, stockpiling, compaction, chemicals i.e. diesel	Local (construction areas only)	No specific 'no go' areas have been identified at this stage; these will be investigated further during the EIA phase.

	spillages).		
Soil Erosion	Erosion of exposed topsoil by rainfall or artificially concentrated run-off.	Local (construction areas only)	No specific 'no go' areas have been identified at this stage and will be investigated further during the EIA phase.
Physical Soil Disturbance	Construction of proposed Wind farm and associated infrastructure.	Local (construction areas only)	No specific 'no go' areas have been identified at this stage and will be investigated further during the EIA phase.
Impacts on Current Land Use	Construction of proposed Wind farm and associated infrastructure	Local (construction areas only)	No specific 'no go' areas have been identified at this stage and will be investigated further during the EIA phase.

Gaps in knowledge & recommendations for further study:

Recommendations:

A detailed site visit will have to be conducted as part of the EIA level investigation and the following parameters should be investigated:

» Soil distribution (classification) on the site;
» Extent of degradation due to current land use;
» Erosion status and erodibility of the soils on the site;
» Mitigation measures to arrest current impacts and manage future impacts associated with the development; and
» Design specifications and layout of proposed development. This detail will guide the specific impacts to be assessed as well as the proposed mitigation measures.

Potential impacts on Vegetation:

Impacts on threatened plants:

Plant species are especially vulnerable to infrastructure development due to the fact that they cannot move out of the path of the construction activities, but are also affected by overall loss of habitat.

Threatened species include those classified as critically endangered, endangered or vulnerable. For any other species a loss of individuals or localised populations is unlikely to lead to a change in the conservation status of the species. However, in the case of threatened plant species, loss of a population or individuals could lead to a direct change in the conservation status of the species, possibly extinction. This may arise if the proposed infrastructure is located

where it will impact on such individuals or populations, and may lead to a negative change in conservation status of the affected species, which implies a reduction in the chances of the species' overall survival chances.

There are two plant species of low conservation concern that have a geographic distribution that includes the site and which have a chance of occurring in the study area, i.e. *Boophane disticha* and *Pelargonium sidoides*. These species are listed as Declining but are wide-spread and relatively common across their range. They are only listed because of heavy harvesting for medicinal use. Both species regenerate easily. They are not expected to be adversely affected by loss of a very small area of habitat where they could occur.

Impacts on indigenous natural vegetation (terrestrial):

The remaining natural vegetation on site is classified as Least Threatened, but falls within a corridor area of the Eastern Cape Biodiversity Conservation Plan (ECBCP). Construction of infrastructure may lead to direct loss of vegetation. This will lead to localised or more extensive reduction in the overall extent of indigenous vegetation. Where this vegetation has already been stressed due to degradation and transformation at a regional level, the loss may lead to increased vulnerability (susceptibility to future damage) of the habitat.

Establishment and spread of declared weeds and alien invader plants

Major factors contributing to invasion by alien invader plants includes high disturbance. Exotic species are often more prominent near infrastructural disturbances than further away (Gelbard & Belnap 2003, Watkins *et al*. 2003). It is not known to what extent the site contains alien plants. Potential weeds with a distribution centred on arid regions of the country include *Salsola kali*, *Atriplex lindleyi*, *Opuntia ficus-indica, Opuntia imbricata, Prosopis glandulosa, Prosopis velutina, Atriplex numularia,* and *Nicotiana glauca*. It is not known which of these alien plants occur on site. The habitats most likely to be affected are watercourses. The invasion of watercourses by alien plants is a biodiversity issue of particular concern in all parts of South Africa.

Issue	Nature of Impact	Extent of Impact	'No go' areas
Fragmentation of populations of affected species	Impacts due to: » Construction of access roads » Clearing of vegetation for the turbine pedestals and construction lay-down areas » Trenches for cables. » Operation of machinery and vehicles which could result in undesirable soil compaction. » Possible fuel and chemical (cement) contamination.	Local	No specific 'no go' areas have been identified at this stage and will be investigated further during the EIA phase.
Reduction in area of occupancy of affected species		Local	
Loss of genetic variation within affected species		Local - Regional	
Negative change in conservation status of habitat		Local	

Increased vulnerability of remaining portions to future disturbance		Local	
General loss of habitat for sensitive species		Local	
Loss in variation within sensitive habitats due to loss of portions of it		Local	
General reduction in biodiversity		Local	
Disturbance to processes maintaining biodiversity and ecosystem goods and services		Local	
Loss of ecosystem goods and services		Local	
Loss of indigenous vegetation		Local	
Change in vegetation structure leading to change in various habitat characteristics		Local	
Change in plant species composition		Local	
Change in soil chemical properties		Local	
Loss of sensitive habitats		Local	
Loss or disturbance to individuals of rare, Endangered, endemic and/or protected species		Local	

Fragmentation of sensitive habitats		Local - Regional	
Change in flammability of vegetation, depending on alien species		Local	
Hydrological impacts due to increased transpiration and runoff		Local	
Impairment of wetland function		Local	

Gaps in knowledge & recommendations for further study:

Limitations:

Red List species are, by their nature, usually very rare and difficult to locate. Compiling the list of species that could potentially occur in an area is limited by the paucity of collection records that make it difficult to predict whether a species may occur in an area or not. The methodology used in this assessment is designed to reduce the risks of omitting any species, but it is always possible that a species that does not occur on a list may be unexpectedly located in an area.

It is recommended that:

The potential impacts on the plant communities in the study area that have initially been identified and described will be assessed according to standard biodiversity assessment practice. The Nature, Duration, Extent, Magnitude, Probability and Significance of each of the identified impacts will be assessed in the detailed EIA investigation.

Potential Impacts on Terrestrial Fauna:

There are no threatened mammal species that have a distribution that coincides with the study area and that have a possibility of occurring on site.

There is one reptile and one amphibian species of conservation concern that have a distribution that coincides with the study area and that have a possibility of occurring on site as a result of habitats available, i.e. the Namaqua Plated Lizard and the Giant Bullfrog. Both species are listed as Near Threatened (the Bullfrog is currently listed globally as Least Concern). The Namaqua Plated Lizard has a wide distribution in South Africa, from the Orange River to Cape

Town and then eastwards to near Grahamstown, including areas from the coast to the Great Escarpment. The Giant Bullfrog also has a wide distribution in South Africa, occurring in most inland areas, extending northwards to include Zimbabwe, Botswana, parts of Namibia, parts of Mozambique and further northwards. Loss of some individuals on site is therefore unlikely to have an effect on overall population numbers. An evaluation on potential impacts on these two species due to development of a wind energy facility on site indicates that impacts are likely to be of very low significance.			
Issue	**Nature of Impact**	**Extent of Impact**	**'No go' areas**
Loss of habitat for threatened flightless fauna	» General loss of habitat for sensitive species; » Disturbance to processes maintaining biodiversity and ecosystem goods and services, as a result of the following: ▪ Excavation of foundations ▪ Clearing of land for construction. ▪ Construction of access roads. ▪ Placement of power lines, cables and water pipelines (if applicable). ▪ Establishment of borrow and spoil areas. ▪ Chemical contamination of the soil by construction vehicles and machinery. ▪ Operation of construction camps. ▪ Storage of materials required for construction.	Local- Regional The proposed wind farm, specifically at the scale of the individual infrastructure within the site. At its greatest extent this may affect the entire site, but is likely to only affect a small proportion of the site. The impact will occur at the site of the proposed wind farm. The potential impact may differ from one species to another, but could affect regional processes within species populations.	No specific 'no go' areas have been identified at this stage and will be investigated further during the EIA phase.
Fragmentation of habitat for threatened/protected terrestrial fauna	» increased fragmentation of habitat and thus populations of species of concern (depending on location of impact); » disturbance to processes maintaining biodiversity. » reduction in area of occupancy of affected species; and » loss of genetic variation within affected species.	Local- Regional	No specific 'no go' areas have been identified at this stage and will be investigated further during the EIA phase.

Loss of individuals of threatened/protected terrestrial fauna	» fragmentation of populations of affected species; » reduction in area of occupancy of affected species; and » loss of genetic variation within affected species.	Local- Regional	No specific 'no go' areas have been identified at this stage and will be investigated further during the EIA phase.
Reduction in area of occupancy of affected species	» Excavation of foundations » Clearing of land for construction. » Construction of access roads. » Placement of power lines, cables and water pipelines (if applicable). » Establishment of borrow and spoil areas. » Chemical contamination of the soil by construction vehicles and machinery. » Operation of construction camps. » Storage of materials required for construction.	Local- Regional	No specific 'no go' areas have been identified at this stage and will be investigated further during the EIA phase.
Loss of genetic variation within affected species	» Excavation of foundations » Clearing of land for construction. » Construction of access roads. » Placement of power lines, cables and water pipelines (if applicable). » Establishment of borrow and spoil areas. » Chemical contamination of the soil by construction vehicles and machinery. » Operation of construction camps. » Storage of materials required for construction.	Local- Regional	No specific 'no go' areas have been identified at this stage and will be investigated further during the EIA phase.
Impacts on biodiversity	Impacts on populations of individual species of concern due to the construction of the Wind farm.	Local- Regional	No specific 'no go' areas have been identified at this stage and will be investigated further during the EIA phase.

Impacts on sensitive habitats	Impacts on any habitats thatare important for threatened fauna due to the construction of the wind farm.	Local- Regional	No specific 'no go' areas have been identified at this stage and will be investigated further during the EIA phase.
Impacts on ecosystem function	Impacts on any processes or factors that maintain ecosystem health and character, including the following: » disruption to nutrient-flow dynamics; » impedance of movement of material or water; » habitat fragmentation; » changes to abiotic environmental conditions; » changes to disturbance regimes, e.g. increased or decreased incidence of fire; » changes to successional processes; » effects on pollinators; » increased invasion by alien plants. » Changes to factors such as these may lead to a reduction in the resilience of habitats and ecosystems or loss or change in ecosystem function.	Local- Regional	No specific 'no go' areas have been identified at this stage and will be investigated further during the EIA phase.
Secondary and cumulative impacts on fauna	Impacts that may arise from changes in the social, economic or ecological environment.	Local- Regional	No specific 'no go' areas have been identified at this stage and will be investigated further during the EIA phase.

Gaps in knowledge & recommendations for further study:

Limitations and exclusions:

» Red List species are, by their nature, usually very rare and difficult to locate. Compiling the list of species that could potentially occur in an area is limited by the paucity of collection records that make it difficult to predict whether a species may occur in an area or not. The methodology used in this assessment is designed to reduce the risks of omitting any species, but it is always possible that a species that does not occur on a list may be unexpectedly located in an area.

» The scoping Terrestrial fauna study (Refer to Appendix F) was based on a desktop assessment only.

» The Terrestrial fauna study excludes avifauna and bats, which are undertaken in separate specialist studies.

Recommendations:

The following assessments will be done during the EIA phase in order to properly assess potential impacts on the ecological receiving environment by the proposed wind farm:

» The presence of species of concern must be evaluated. This must be done by assessing habitat suitability for those species that have been assessed as potentially occurring in the area through field investigations.

Potential Impacts on Wetlands and Water Courses:

The site contains a number of watercourses and drainage lines, some of significant extent. These may be affected by access roads or inappropriately placed infrastructure. Construction 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 (susceptibility to future damage) of the habitat. Physical alteration to wetlands can have an impact on the functioning of those wetlands. Refer to Figures 8.1 and 8.2 indicating sensitivity of wetlands and water courses on the proposed site.

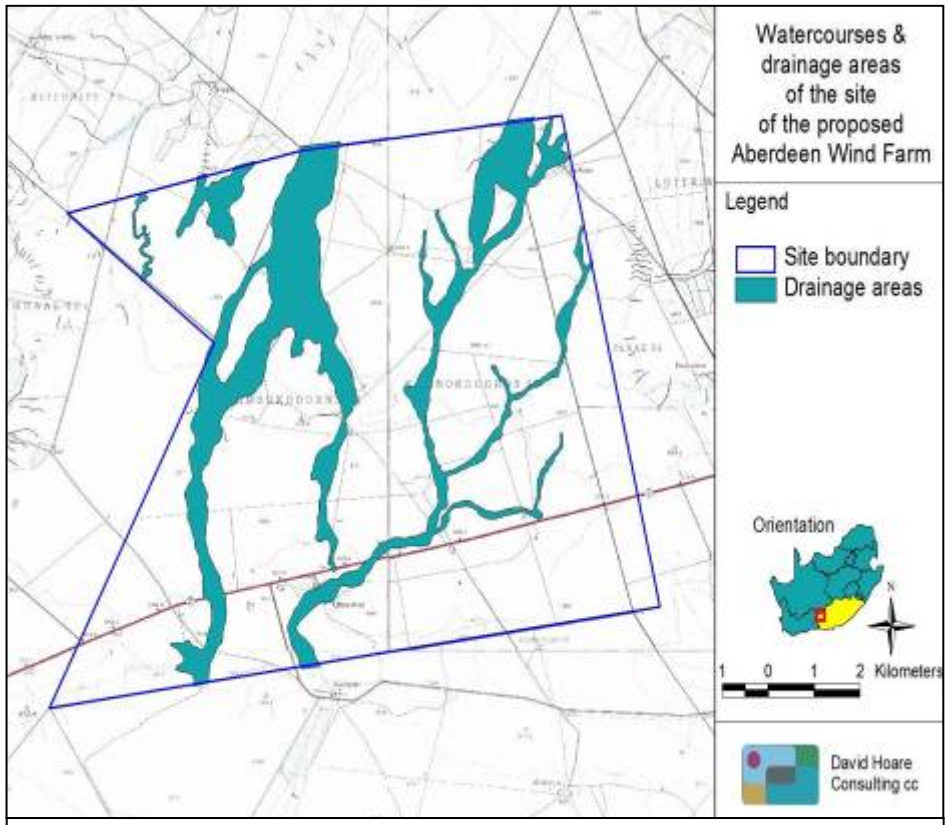


Figure 8.1: Main watercourses/drainage areas of the study area

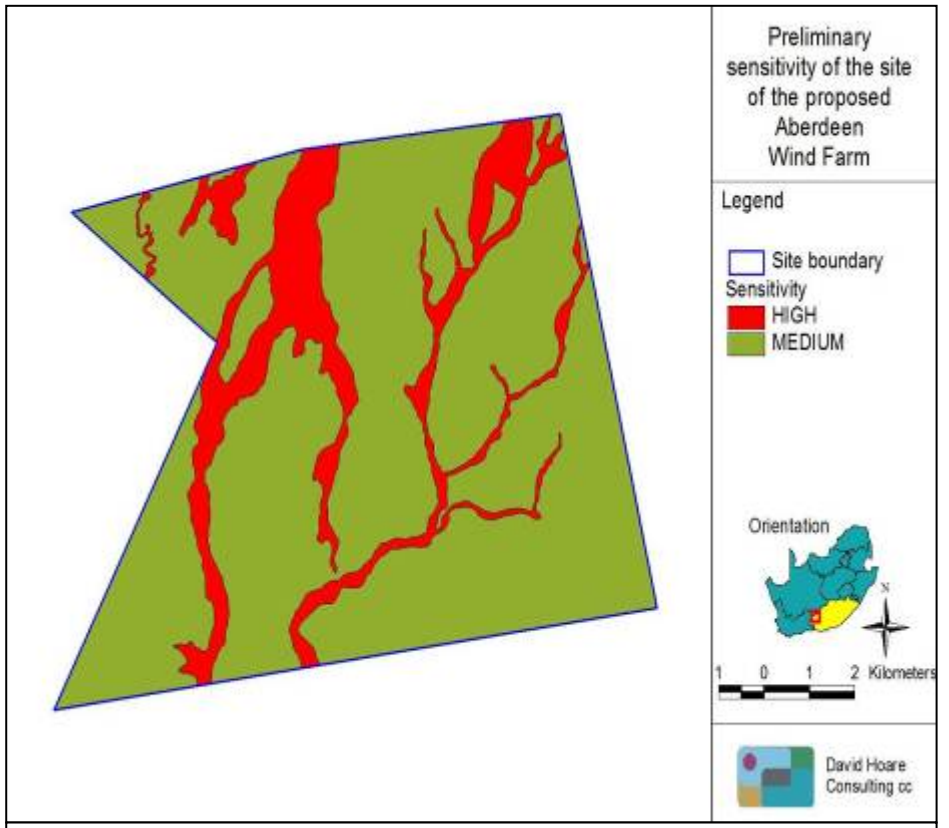


Figure 8.2: Preliminary sensitivity within different parts of the study

Issue	Nature of Impact	Extent of Impact	'No go' areas
Increased loss of soil	Dry river beds and drainage lines are an important habitat for a number of species in the study area, including those with a restricted distribution or species with an elevated conservation status. Non-perennial drainage lines do occur on the site and without mitigation negative impacts on these drainage lines could occur due to site preparation and construction activities associated with the wind energy facility.	Local	No "no-go" areas have been identified at this stage; however non-perennial drainage lines do occur on the site and are treated as potentially sensitive.
Loss of or disturbance to indigenous wetland vegetation		Local	
Loss of sensitive wetland habitats		Local	
Loss or disturbance to individuals of rare, endangered, endemic and/or protected species that occur in wetlands		Local	
Fragmentation of sensitive habitats		Local	
Impairment of wetland function		Local	
Change in channel morphology in downstream wetlands, potentially leading to further loss of wetland vegetation		Local	
Reduction in water quality in wetlands downstream of road		Local	

Gaps in knowledge & recommendations for further study:

» The presence and distribution of watercourses and drainage lines on site must be confirmed in the field. This will be done primarily using aerial photograph interpretation, but will be confirmed in the field using topographic and floristic indicators.

Potential Impacts on Avifauna (birds):

The proposed site was found to be moderately sensitive in terms of avifauna, with areas of high, medium and unknown sensitivity being present on site (Refer to figure 8.3). Various micro habitats were observed on site and within the broader study area. On the site itself, the most important and prevalent micro-habitats are Farm Dams, Cultivated Lands, and Karroo Shrublands, with the latter being the most extensive. The list of 'focal species' for this study is as follows: Martial Eagle, Lesser Kestrel, Rock Kestrel, Black Harrier, Ludwig's Bustard, Blue Crane, Secretary Bird and White Stork. Blue Cranes appeared abundant and were observed on numerous occasions on the site during the site visit undertaken by the avifauna specialist (Refer to Appendix G for complete Avifauna Report).

Issue	Nature of Impact	Extent of Impact	'No go' areas
Disturbance by construction and maintenance activities	Construction & maintenance	Local	No specific 'no go' areas have been identified at this stage and will be

			investigated further during the EIA phase.
Habitat loss – destruction, disturbance and displacement	Construction footprint	Local	No specific 'no go' areas have been identified at this stage and will be investigated further during the EIA phase.
Gaps in knowledge & recommendations for further study: » A full EIA and a pre-construction monitoring phase is recommended as it will generate more detailed assessments of all potential impacts, provide passage rates of critical species and better inform recommended mitigation where necessary.			

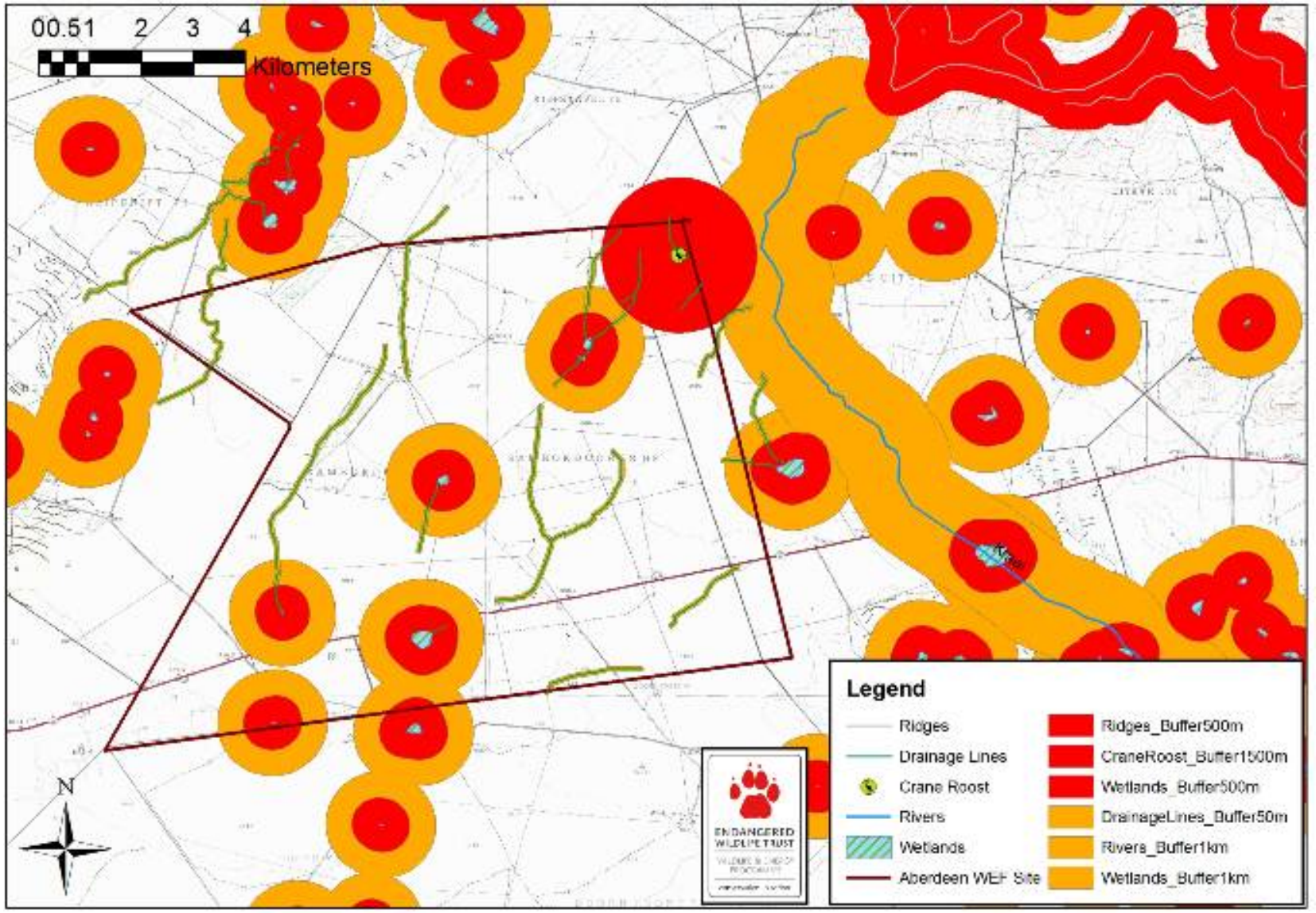


Figure 8.3: Avifauna Sensitivity analysis of the proposed site

Impacts on bats:

Several bat species were recorded as having a probability of being present on the site and surrounding area. Some foraging habitat may be destroyed by the construction of the turbines and associated infrastructure. This impact is a negative and local impact that will be more significant during construction than during the operation of the wind farm. This impact has a potential probability of occurrence

During the construction phase of the project, possible bat roosts may be impacted by earthworks and large machinery. Diggings related to the placement of underground cables can also damage bat roosts. This is a negative local impact being applicable only during the construction phase. On the contrary this may be perceived as a neutral local impact after construction since the new turbines and associated structure will provide additional roosting space for some species of bats. But it is important to understand that this may be upsetting to the ecology since the new structures will benefit only a few species unnaturally.

In figure 8.4 the areas where bats are most likely to forage have been marked as having a high sensitivity (red shading), and includes the streams and waterways draining from the Kamdeboo Mountains. The Southern Karoo Riviere vegetation unit may also have more moisture and therefore insect activity than the rest of the site and is assigned a moderate sensitivity.

It is important to note that this Scoping phase sensitivity map is not intended to govern the ideal locations of wind turbines with regards to bat sensitivity, but rather to highlight areas that will require special attention during the detailed EIA phase, although the areas not marked with a high sensitivity should still be monitored.

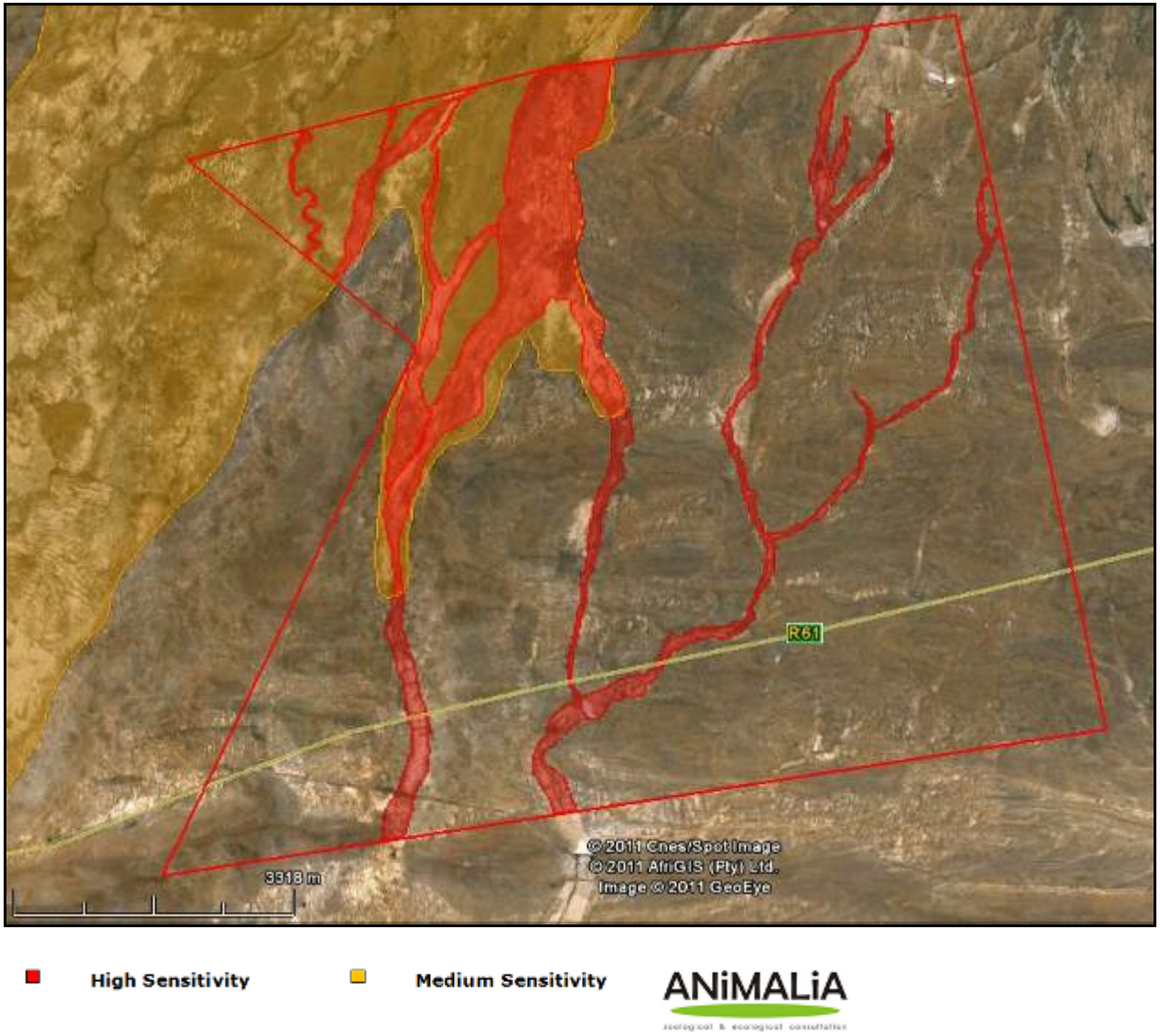


Figure 8.4: Potential bat sensitivity on the proposed site

Issue	Nature of Impact	Extent of Impact	'No go' areas
Destruction of foraging habitat	Construction & maintenance	Regional - The impact will occur at the site of the proposed Wind farm, but will have an impact at a more regional level, since it affects entire populations of affected species and may affect migration routes of species.	Cannot be determined at this stage.
Destruction of roosts	Construction & maintenance	Regional - The impact will occur at the site of the proposed Wind farm, but will have an impact at a more regional level, since it affects entire populations of affected species and may affect migration routes of species.	Cannot be determined at this stage.

Gaps in knowledge & recommendations for further study:

Limitations:

The existing impacts on the study area are limited to some agricultural practices, primarily live stock grazing, with little major developmental modifications. The available literature on South African bat behaviour and ecology is limited, especially on behavioural acts pertaining to large geographical regions. Much of the knowledge of bat behaviour is therefore still relatively uncertain in comparison to more charismatic species of animals. Areas on the site to be designated as having a higher bat activity and/or diversity, is deemed as such based on the occurrences of certain environmental and terrain features that will be favourable to bats.

Recommendations:

» Areas of higher bat foraging activity should be identified and these areas should be treated with more caution and unnecessary habitat clearance avoided. During the detailed specialist EIA study a sensitivity map will be compiled after a site visit has been conducted, and the terrain explored in more detail on foot to enable discovery of possible bat roosts.

» All diggings and earthworks must be kept to a minimum especially in rocky outcrop areas (should these exist on site), and blasting should be minimised.

Potential impacts on Heritage Resources

The area proposed for the Aberdeen Wind Energy Facility has not been systematically researched archaeologically, although, there is enough information available, such as previous phase 1 archaeological impact assessments closer to the proposed area and within the wider region to determine the probable archaeological artefacts and remains that may be encountered during the impact assessment. It has been established that the semi-arid Karoo region stretching across the Eastern Cape and Western Cape seems marginal regarding pre-colonial human settlement although is rich in archaeological sites and rock art. There is a variety of archaeological resources within the proposed area that may be encountered, ranging from Early, Middle and Later Stone Age stone artefacts as well as associated organic and material remains. Khoekhoen pottery, rock engravings, human remains and graves, the remains of historical buildings, features and European ceramics, as well as stone-walled kraals of both pre-colonial and historical origin may also be encountered during the survey.

The environment (archaeological and heritage resources) will be affected by the proposed project. No archaeological sites have been systematically plotted within the proposed area for development, it is difficult, in the scoping phase, to assess the potential significance and identify issues based on the nature and extent of direct, indirect or cumulative impacts in detail.

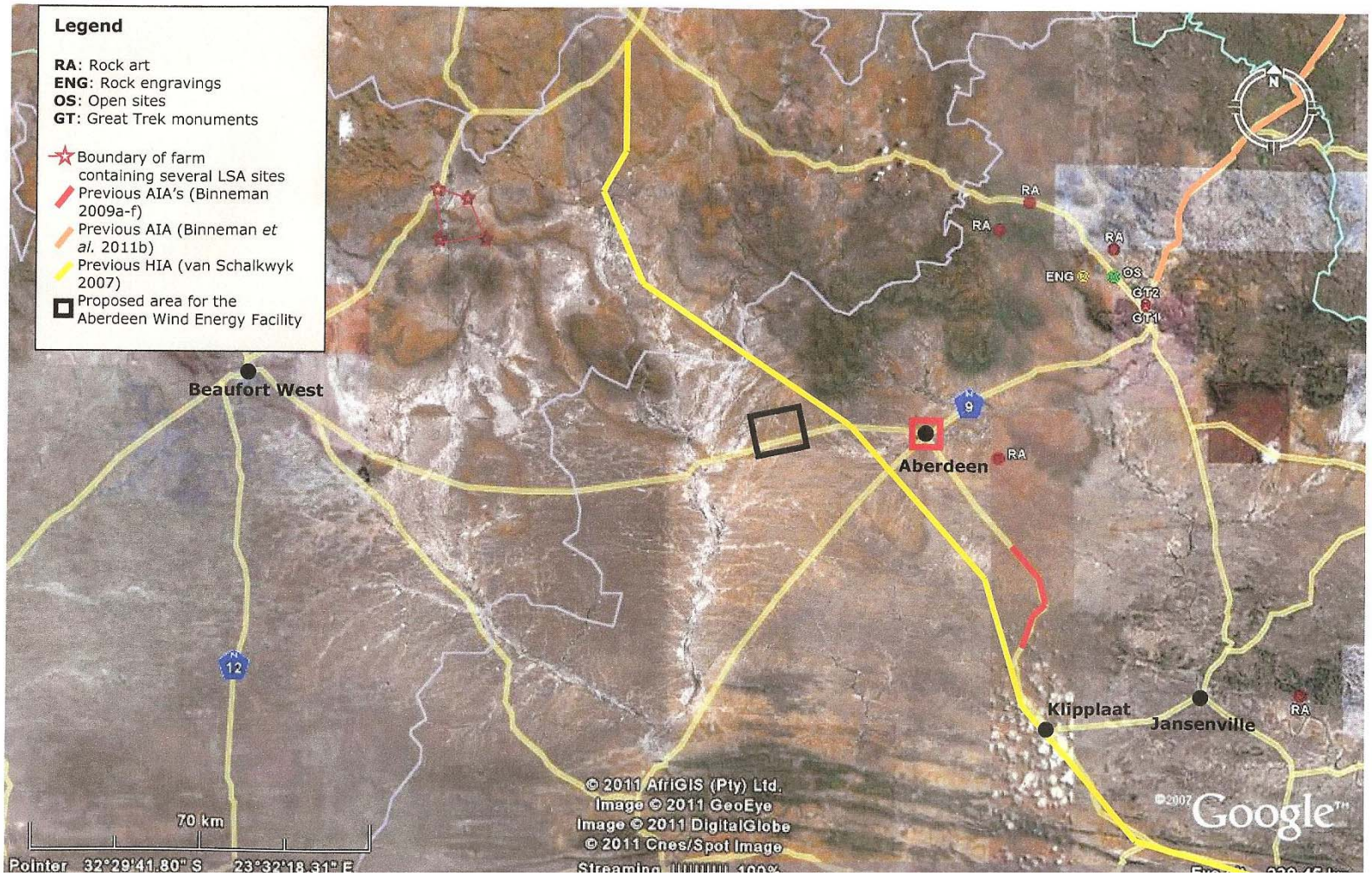


Figure 8.1: Aerial view of the proposed area for the Aberdeen Wind Energy Facility showing the location of recorded heritage sites and previous specialist studies around the proposed study area.

Issue	Nature of Impact	Extent of Impact	'No go' areas
Pastoralism (Stone Artefacts)	Construction of the wind farm and associated infrastructure	Local	No 'no- go' areas have not been identified at this stage.
Human Remains	Construction of the wind farm and associated infrastructure	Local	No 'no- go' areas have not been identified at this stage.
Rock Art (Paintings and Engravings)	Construction of the wind farm and associated infrastructure	Local	No 'no- go' areas have not been identified at this stage.

Gaps in knowledge & recommendations for further study:

No limitations were identified by the specialist.

During the EIA phase of the project it is suggested that:

» Archaeological resources, heritage sites i.e. like old buildings/structures and graves will be identified and assessed. These assessments will be evaluated and compared to the potential impact of the proposed project and appropriate recommendations and mitigation measures will be made so as to lessen the negative impact that the proposed project may incur on the archaeological and heritage resources.

» Conduct a paleontological study

Potential noise impacts:

Construction activities may include the following:

» construction of access roads,
» establishment of turbine tower foundations and electrical substation(s),
» the possible establishment, operation and removal of concrete batching plants,
» the construction of any buildings,
» digging of trenches to accommodate underground power cables and potentially other infrastructure such as pipelines; and
» the erection of turbine towers and assembly of Wind Turbine Generators (WTGs).

The equipment likely to be required to complete the above tasks will typically include:

» excavator/grader, bulldozer, dump trucks, vibratory roller, bucket loader, rock breaker, (potentially) drill rig, dump truck, flatbed trucks, concrete truck(s), cranes, fork lift and various 4WD and service vehicles.

The noise impact assessment (Appendix L) indicated that the proposed project could have an impact of a low to high significance on the noise climate in the surrounding area during construction as there are Noise-sensitive developments (NSD) within the potential area of influence.

Issue	Nature of Impact	Extent of Impact	'No go' areas
Noise impacts due to construction equipment and activities	Noisy activities and equipment is likely to be associated with: » (potential) borrow pit; » concrete batching/delivery; » foundation preparation; and » the digging of trenches	Local	Cannot be determined at this stage.
Noise impacts due to blasting (if required)	» Blasting	Local	Cannot be determined at this stage.
Noise impacts due to construction traffic	Increased traffic due to: » deliveries and » movement onsite	Local	Cannot be determined at this stage.

Gaps in knowledge & recommendations for further study:

Limitations:

» There is no information available regarding the existing soundscape of the area.
» Projected impacts from the construction phase can only be modelled once more information regarding the duration of construction and equipment used are known.

Recommendations:

The following construction activities will be considered in the EIA studies, taking cognisance of the worst-case scenario (activities close to a potential sensitive receptor):

» the (potential) borrow pit,
» concrete batching/delivery,
» foundation preparation,
» the digging of trenches and
» increased traffic (deliveries and movement onsite)

It is recommended that the potential noise impact associated with the proposed Wind farm be investigated in more detail in the Environmental Impact Assessment phase. The following information is considered critical:

» The prevailing night-time background ambient noise levels,
» The available meteorological data,
» The exact locations of the various WTGs in the wind farm,
» The full specifications of the WTGs,
» The confirmation of the Noise-sensitive developments, and;
» An overview of the equipment, processes and schedules for the construction phase.

Potential impacts on the social environment:

A number of key social issues are potentially associated with the construction of the Proposed Wind farm. The potential positive social impacts associated with the proposed Aberdeen wind farm during the construction phase are largely linked to the creation of employment and skills development opportunities. Potential impacts are linked to the impact on local road surfaces associated with the transport of heavy components and the impact on local communities and current farming activities associated with the presence of construction workers on the site.

The key conclusions of the Scoping level study are as follows:

» The establishment of wind energy facilities are supported at national, provincial and local levels.
» Key potential construction phase issues for further investigation during the EIA phase relate to the recruitment and on-site management of construction labour and the management of impacts on local roads.

Detailed consultation with affected stakeholders will be undertaken by the SIA consultant during the assessment component of the SIA.

Issue	Nature of Impact	Extent of Impact	'No go' areas
Formulating appropriate labour recruitment strategies, specifically bearing in mind the potential of opportunistic labour in-migration	Influx of job seekers into the area (limited positive impact)	Local, Regional and National	N/A
The formulation of suitable training strategies, specifically bearing in mind the generally very low education and skills levels in the local area	Skills development (limited positive impact)	Local, Regional and National	N/A

The appropriate siting of the construction camp	Sense of place	Local, Regional and National	N/A
Adequate on-site management of construction crews	Risks related to infrastructural damage, veld fires and stock and game losses on adjacent properties	Local	N/A
The provision of adequate services and facilities for construction crews	Health risks	Local	N/A
Managing health risks associated with large groups of construction workers, including the spread of STDs, HIV/Aids and TB	Health risks	Local, Regional and National	N/A
Job creation	Maximising opportunities to local and regional SMMEs and other businesses to provide a range of services, which may include, but not limited to, catering, laundry, transport (limited positive impact)	Local, Regional and National	N/A
Increase in construction activity due to the proposed construction of the wind farm	Potential impacts on traffic flows along roads in the study area associated, with the movement of heavy equipment onto the site	Local	N/A
Crime	Influx of job seekers, and criminal elements, into the area	Local, Regional and National	N/A
Traffic	Potential impacts on traffic flows along roads in the study area associated, with the movement of heavy equipment onto the site.	Local	N/A
Impact on local farmers in the area	» Potential threat to farm safety due to increased number of people in the area and construction workers; » Potential stock losses » Potential damage to water and other farm infrastructure	Local	N/A

	» Potential damage to roads by heavy equipment and increased traffic volumes Potential impact on farming operations and loss of productive land		

Gaps in knowledge & recommendations for further study:

Limitations:

The information presented in the Social Scoping level study is based on available desktop sources only. With regard to the study area, the amount of relevant literature available is limited. Baseline information presented in this report will be supplemented and amended by information obtained from interviews with key local officials and community members during field interviews envisaged as part of the EIA phase.

» Demographic data

The demographic data used in the study is largely based on the 200119 Census. While this data does provide useful information on the demographic profile of the affected area, the data are dated and should be treated with care.

Recommendations:

Methodology to be undertaken for the EIA phase:

» Review of existing project information, including the Planning and Scoping Documents;
» Collection and review of reports and baseline socio-economic data on the area (IDPs, Spatial Development Frameworks etc.);
» Site visit and interviews with key stakeholders in the area including local land owners and authorities, local community leaders and councillors, local resident associations and residents, local businesses, community workers etc;
» Identification and assessment of the key social issues and opportunities;
» Preparation of Draft Social Impact Assessment (SIA) Report, including identification of mitigation/optimization and management measures to be implemented.
» Finalisation of SIA Report.

[19] The last comprehensive national census is South Africa was conducted in 2001. The census provided demographic and socio-economic data from National to Municipal Ward level. In 2007 a large-scale Community Survey was conducted in all the provinces of South Africa. A sample population (949 105 people) and households (246 618) were enumerated and the results were then weighted to produce the final data sets. The main objective of the survey was to provide demographic and socio-economic data National to Municipal level only. The next full national census was undertaken in 2011. The results of this census are not yet available.

The following typical, generic project information is required in order to inform the Social Impact Assessment (Including all related infrastructure such as transmission lines, access roads, office and warehouse components)

- Comments received from I&APs during the public participation process, including comments reflected in the Final Scoping Report;
- A draft illustration (plan) of the proposed wind turbines and associated infrastructure;
- Duration of the construction phase (months);
- Number of people employed during the construction phase;
- Breakdown of number of people employed in terms or low skilled, semi-skilled and skilled;
- Estimate of the total wage bill for the construction phase and breakdown in % as per skills categories;
- Estimate of total capital expenditure for construction phase;
- Indication of where construction workers will be housed (on site or in nearest town?);
- Opportunities for on-site skills development and training;
- Description of the typical activities associated with the construction phase, specifically on-site construction activities. This includes a description of how the large components associated with a wind farm will be transported to the site and assembled on the site;
- The size of the vehicles needed to transport the components and the routes that will be used to transport the large components to the site, and an estimate of the number of vehicle trips required and duration of each trip;
- Information on the nature of the agreements with the affected landowners, specifically with regard to compensation for damage to land, infrastructure etc.

8.2. Evaluation of potential impacts associated with the OPERATION PHASE of the proposed Aberdeen 200MW Wind farm north-west of Aberdeen

Potential Visual Impacts:

The result of the preliminary viewshed analyses for the proposed facility is shown on Figure 8.2. The initial viewshed analysis was undertaken from preliminary vantage points within the proposed development area at offsets of 140m above average ground level (i.e. the approximate hub height of the proposed wind turbines). This was done to determine the general visual exposure of the area under investigation, simulating the proposed structures associated with the facility. It must be noted that the viewshed analyses do not include the effect of vegetation cover or existing structures on the exposure of the proposed wind turbines, therefore signifying a worst-case scenario. The viewshed analyses will be refined once a layout of the wind energy facility is completed and will be regenerated per actual turbine position (and actual proposed turbine height) during the EIA phase of the project. This will be undertaken for the full number of turbines proposed.

Figure 8.2 indicates areas from which any number of turbines (with a minimum of one turbine) could potentially be visible as well as proximity offsets from the proposed development area. The proposed facility will have a large core area of potential visual exposure on the wind farm site itself, and within a 5km offset. Almost the entire area within 5km will be visually exposed to the wind farm. This core area includes the R61, two secondary roads and a number of farms and homesteads. The south western tip of the Kamdeboo Mountains also lies within this zone, and the south western slopes will be visually exposed. Potential visual exposure remains high in the medium distance (i.e. between 5 and 10km) with visually screened areas occurring only in the north east within the mountains. In general, the southern and western slopes of the mountains are exposed to potential visual impact. Receptors likely to be visually exposed include the R61, three secondary roads and residents of farms and homesteads. In the longer distance (i.e. between 10km and 20km), potential visual exposure decreases somewhat, especially in the north eastern mountains. Some south and west facing slopes will still be visually exposed, however. Visual receptors that may experience visual impact include users of the N9, the R61, secondary roads as well as a number of farms and homesteads.

It is envisaged that the turbine structures would be highly visible to observers travelling along the National and arterial roads and residing on the farms and in homesteads throughout the study area. The facility would constitute a high visual prominence within this environment, especially within a 10km radius, potentially resulting in a visual impact.

Issue	Nature of Impact	Extent of Impact	'No go' areas
The visibility of the facility to, and potential visual impact on, observers travelling along national (i.e. N9), arterial (i.e. R61) and secondary roads in close proximity to the	Visual exposure to wind turbines and associated infrastructure.	Local	Cannot be determined at this stage.

proposed wind farm and within the region.			
The visibility of the facility to, and potential visual impact on farms and homesteads in close proximity to the proposed wind farm and within the region.	Visual exposure to wind turbines and associated infrastructure.	Local	Cannot be determined at this stage.
The potential visual impact of the facility on the visual character of the landscape and sense of place of the region.	Visual exposure to wind turbines and associated infrastructure.	Local	Cannot be determined at this stage.
The visibility of the facility to, and the potential visual impact on scenic and sensitive topographic features within the region, specifically the Kamdeboo mountains.	Visual exposure to wind turbines and associated infrastructure.	Local	Cannot be determined at this stage.
The potential visual impact of the facility on tourist routes, tourist destinations and tourist potential of the region.	Visual exposure to wind turbines and associated infrastructure.	Local	Cannot be determined at this stage.
The potential visual impact of shadow flicker on observers residing on or in close proximity to the proposed wind farm.	Visual exposure to wind turbines and associated infrastructure.	Local	Cannot be determined at this stage.
The potential visual impact of ancillary infrastructure (i.e. the substation, the internal access roads, the borrow pits, the office / workshop and the visitor centre) on observers in close proximity to the proposed wind farm.	Visual exposure to associated infrastructure.	Local	Cannot be determined at this stage.
The potential visual impact of operational, safety and security lighting of the facility at night on observers in close proximity to the proposed wind farm.	Visual exposure to wind turbines and associated infrastructure.	Local	Cannot be determined at this stage.
Potential cumulative visual impacts of the proposed wind farm.	Visual exposure to wind turbines and associated infrastructure.	Local	Cannot be determined at this stage.

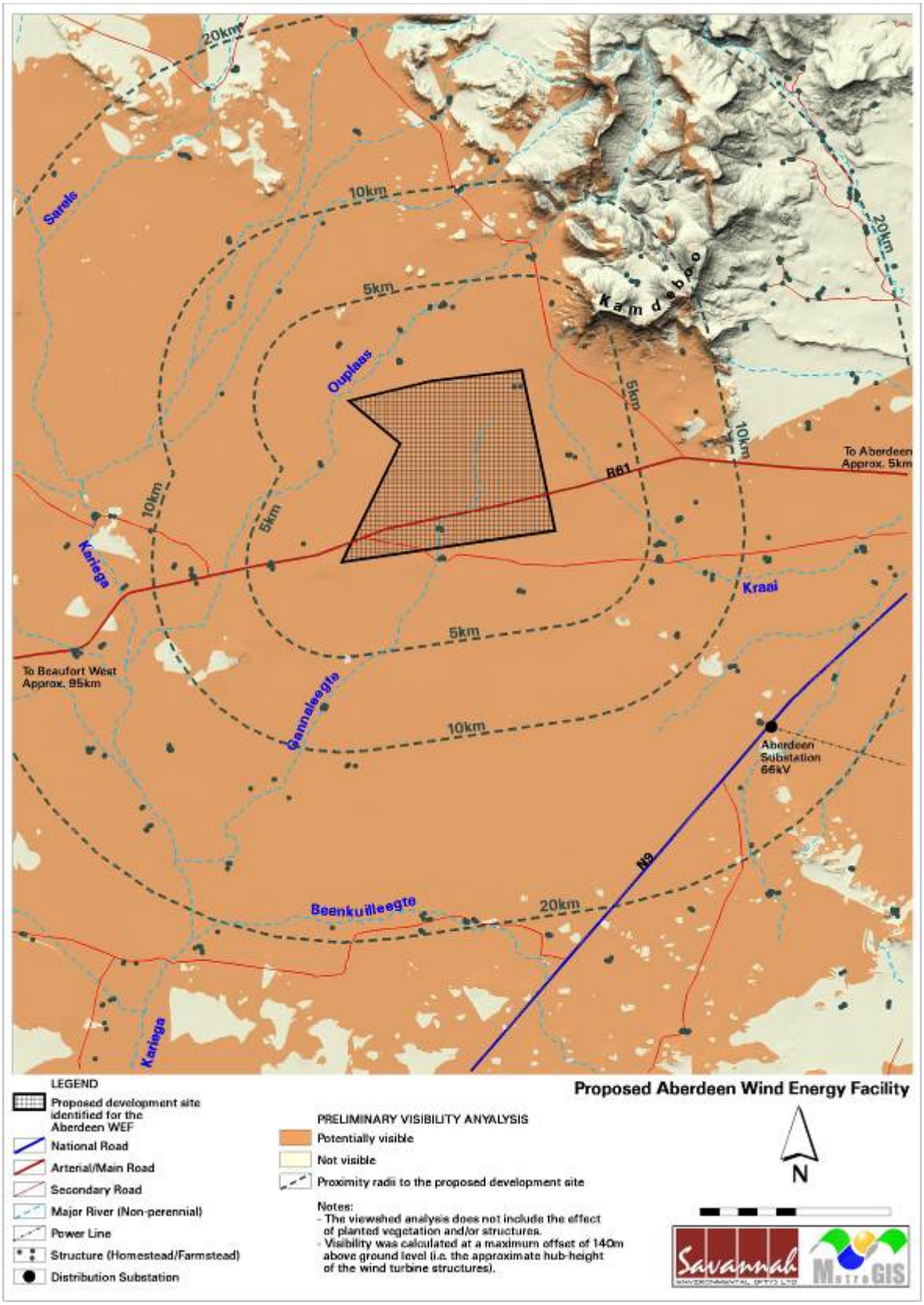


Figure 8.2: Map indicating the Potential visual exposure of the proposed wind farm *(Note: the visible area indicates areas from which any number of wind turbines (with a minimum of one turbine) may be visible. NB:* nothing apart from topography has been considered in this figure – as per the VIA report contained in Appendix J).

Gaps in knowledge & recommendations for further study:

The potential visual impacts need to be assessed in greater detail during the EIA phase of the project.

It is recommended that:

» The viewshed analyses be refined once a layout of the wind farm is completed and will be regenerated per actual turbine position (and actual proposed turbine height) during the EIA phase of the project. This will be undertaken for the full number of turbines proposed.
» The severity of the potential visual impact on sensitive receptors be assessed in further detail in the EIA.
» Additional spatial analyses must be undertaken in order to create a visual impact index that will further aid in determining potential visual impact.
» Specific spatial criteria need to be applied to the visual exposure of the proposed facility in order to successfully determine visual impact and ultimately the significance of the visual impact.
» In addition, photo simulations of critical viewpoints should be undertaken where required, in order to aid in the visualisation of the envisaged visual impact.

Impacts on Avifauna:

In general the site is moderately sensitive in terms of avifauna, based on the occurrence of a number of listed species in the study area, as well as the various micro-habitats available to avifauna.

The list of 'focal species' for this study is as follows: Martial Eagle, Lesser Kestrel, Rock Kestrel, Black Harrier, Ludwig's Bustard, Blue Crane, Secretary Bird and White Stork. Blue Cranes appeared abundant and were observed on numerous occasions on the site during the site visit.

Potential impacts on birds as a result of the proposed project are expected to include collisions of birds with turbines, habitat loss through destruction, disturbance and displacement and impacts of associated infrastructure such as substations and overhead lines.

Issue	Nature of Impact	Extent of Impact	'No go' areas
Collisions of birds with turbines	Collision with turbine blades	Regional - The impact will occur at the site of the proposed Wind farm, but will have an impact at a more regional level, since it affects entire populations of affected species and may affect migration routes of	Cannot be determined at this stage.

		species.	
Habitat loss – destruction, disturbance and displacement	Noise and movement	Local	Cannot be determined at this stage.
Impacts of associated infrastructure	The maintenance of substations, servitudes and roadways causes both temporary and permanent habitat destruction and disturbance.	Local to Regional. -The impact will occur at the site of the proposed Wind farm, but will have an impact at a more regional level, since it affects entire populations of affected species and may affect migration routes of species.	Cannot be determined at this stage.

Gaps in knowledge & recommendations for further study:

Limitations:

» Inaccuracies in the sources of information used for the avifauna study (Refer to Appendix G of this report) could limit this study. In particular, the Bird Atlas data is now 14 years old (Harrison et al 1997).
» This study relies entirely upon secondary data sources such as the Atlas of Southern African Birds (Harrison et al 1997). The scope of this scoping phase did not allow for any significant primary data collection by the EWT (avifauna specialist- Endangered Wildlife Trust) on the proposed site.
» The site visit was conducted in spring, over which time various species may not have been present in the study area.
» The entire site was not accessible during the site visit.

Recommendations:

» All identified issues will be investigated in more detail during the EIA phase, and rated according to the prescribed criteria.
» Alternatives will be considered in more detail.
» Landscape factors relevant to this study will be investigated further.
» Suitable mitigation measures will be recommended for all issues identified as significant.
» The extent to which collision and displacement impacts actually occur will need to be determined through rigorous pre and post construction monitoring as outlined in Jenkins et al (2011), and discussed in Appendix 2 of the Avifauna Report (Refer to Appendix G).
» It is recommended that Pre-construction monitoring on the site begins a soon as possible, so that data collected can be used to inform the final Avifaunal EIA report.
» A site specific avifaunal EMP as well as a monitoring programme pre- and post-construction is seen as a critical next step to increase our confidence, refine the sensitivity map and to strengthen the mitigation measures in order to have the least impact possible on avifauna in the area.
» Details of the proposed monitoring methodology are contained in Appendix 1 of the Avifauna Report (Refer to Appendix G).

» It is recommended that an avifaunal specialist be appointed by Eskom to refine this methodology for the proposed site, and to train and supervise observers, analyse data and report on the monitoring programme.

Impacts on bats:

The site displays a possibility of two of the three factors necessary for bat occurrence, namely the possibility of seasonal surface water and probability of insects due to surface water and streams, suggesting that it is likely to have a higher bat activity in the areas where the most moisture will be available. From **the bat study** (Refer to Appendix H) it can be concluded that special attention needs to be given to the possible presence of *Rhinolophus capensis* and *Miniopterus natalensis* during the full detailed EIA phase site visit.

Additionally, the Kamdeboo Mountains to the north east of the site can offer a multitude of roosting space for bats that have a high probability of foraging down the valleys and drainage gulleys of the waterways draining from the mountains. Therefore the water ways and area forming part of the Southern Karoo Riviere vegetation unit can act as important bat foraging corridors.

There is a concern of bats and possible wind turbine blade collisions. Apart from physical collisions, a major cause of bat mortality at wind turbines is barotrauma. This is a condition where the lungs of a bat collapse in the low air pressure around the moving blades, causing severe and fatal internal haemorrhage. International research and experiments are unable to suggest sustainable large scale mitigation measures that can move this threat to a category of no concern. This is a negative regional direct impact that can have a cumulative effect effective for the lifetime of the wind farm, with a low probability of occurrence.

The migration paths of South African bats in the Cape Provinces are virtually unknown. Cave dwelling species like *Miniopterus natalensis* and *Myotis tricolor* undertake annual migrations, although no caves are known to be in close proximity to the study area. This is a negative, direct and potentially cumulative (especially if other proposed wind farms are also considered) national impact, that is effective for the lifetime of the wind farm. Due to a great lack in local knowledge of the South African bat migration routes, this impact needs to be conservatively anticipated to have a moderate probability of occurrence.

This is a negative, direct and potentially cumulative (especially if other proposed wind farms are also considered) national impact, that is effective for the lifetime of the wind farm.

Issue	Nature of Impact	Extent of Impact	'No go' areas
Bat mortalities due to blade collisions and barotrauma during foraging	» Rotating turbine blades	Regional - The impact will occur at the site of the proposed Wind farm,	Cannot be determined at this stage.

		but will have an impact at a more regional level, since it affects entire populations of affected species and may affect migration routes of species.	
Bat mortalities due to blade collisions and barotrauma during migration	» Rotating turbine blades	Regional - The impact will occur at the site of the proposed Wind farm, but will have an impact at a more regional level, since it affects entire populations of affected species and may affect migration routes of species.	Cannot be determined at this stage.

Gaps in knowledge & recommendations for further study:

Limitations:

The existing impacts on the study area are very limited and seem to include some mining activities particularly in the northern parts. The available literature on South African bat behaviour and ecology is limited, especially on behavioural acts pertaining to large geographical regions. Much of the knowledge of bat behaviour is therefore still relatively uncertain in comparison to more charismatic species of animals. Areas on the site to be designated as having a higher bat activity and/or diversity, is deemed as such based on the occurrences of certain environmental and terrain features that will be favourable to bats.

Recommendations:

» It is important to note that this scoping phase sensitivity study is not intended to govern the ideal locations of wind turbines with regards to bat sensitivity, but rather to provide guidance for the EIA phase, although the site is deemed to have a low bat sensitivity, the entire site should still be critically investigated and bat activity monitored.
» True bat foraging activity needs to be determined in the EIA phase.
» Avoiding the placement of wind farms and individual turbines in areas of high bat activity can significantly lessen the impact of wind farms on bat fauna. Therefore it is proposed that areas of higher bat activity be identified in the EIA assessment and site visit with nocturnal monitoring, and these areas preferable be avoided in turbine placement. Affordable pre-construction long term monitoring data can be correlated with meteorological data and consequently provide more accurate data for implementation of mitigation measures, such as the ideal wind speed to use as a cut in speed.
» Pre construction monitoring is more favourable than post construction monitoring, since some bat fatalities may already occur before the mitigation measures are perfected for the site. Additionally the areas identified in the desktop phase, where implementation of mitigation measures are likely to be prioritized, must receive special attention in the EIA phase.

» Even though no known caves are in close proximity, it will be beneficial to collaborate with academic institutions to promote research on the subject. It is essential to establish that the site is not within any bat migration routes, and if so during what time and season of the year does migration take place. This can be achieved through pre-construction monitoring and quantifying the risks more accurately. After which, if the site falls in line with a migration route, aggressive mitigation measures can be applied during the established times of bat migrations. An example of such a very aggressive mitigation measure would be to keep turbines static at night during periods of bat migrations, which can be several weeks at a time and occurring at least twice a year.

Potential Heritage Impacts:

Potential impacts on heritage as a result of the operation of the wind farm relate to visual impacts on areas around heritage structures and cultural landscapes, as well as impacts on sense of place.

There are no towns or urban centres within the study area, but a number of farms and homesteads occur throughout the study area. These tend to lie in the vicinity of the rivers. The population density within the region is low, at an average of 5,8 people per km^2. The greater region is generally seen as having a high scenic value and lies en-route to a number of known tourist destinations, including the so-called Sunshine Coast. The study area has a rural character with very few structures. Electrical infrastructure is limited to a single power line linking with the Aberdeen Substation to the south east of the site. There are no formally protected conservation areas within the study area

Issue	Nature of Impact	Extent of Impact	'No go' areas
Built environment	Physical structural appearance of the Wind farm.	Local	No 'no- go' areas have been identified at this stage.
Cultural landscapes and sense of place	Physical structural appearance of the Wind farm.	Unknown at this stage of impact assessment	No 'no- go' areas have been identified at this stage.

Gaps in knowledge & recommendations for further study:

During the EIA phase of the project it is suggested that:

» Archaeological resources will be identified and assessed. These assessments will be evaluated and compared to the potential impact of the proposed project and appropriate recommendations and mitigation measures will be made so as to lessen the negative impact that the proposed project may incur on the archaeological and heritage resources.

Potential noise impacts:

Increased noise levels can directly be linked with the various activities associated with the operational phase of the activity. During this evaluation, more focus was placed on the impacts on the surrounding noise environment during times when a quiet environment is highly desirable. Noise limits should therefore be appropriate for the most noise-sensitive activity. Noise-sensitive activities such as sleeping, or areas used for relaxation or other activities (places of worship, school, etc) should determine appropriate Zone Sound Levels. However, for the noise Scoping report the $L_{Req,N}$ of **35dBA** as proposed by SANS 10103 was used. Refer to Figure 8.4 for image indicating noise sensitive developments in relation to the proposed study area.

Commonly the most significant stage relating to noise is the operational phase. The sources of noise include:

» Aerodynamic noise is emitted by a wind turbine blade (sound of the wind turbine "cutting" wind – low frequency noise)
» Mechanical noise (from the gear-box / generator)
» Transformer noises (sub-stations)
» Transmission Line noise (Corona noise)
» Low frequency noise
» Amplitude modulation of the sound emissions from the wind turbines

The worst case scenarios as indicated in the noise study (Appendix L) illustrates the situation where atmospheric conditions are favourable for sound propagation, with the wind speeds above the cut-in speeds of the Wind Turbine Generator (WTG), but before wind induced noises start to mask the noises from the WTG.

Based on the total area that could be influenced by the construction and operation of the Wind farm, it has been concluded that it is possible that there are potential receptors (to be confirmed during EIA phase) that could be affected by the facility. The significance of this impact however would depend on:

» Equipment selected for the construction and operational phase,
» The total number of wind turbines or other noise sources operational within 5,000 meters from the potential sensitive receptors (all noise sources within a 5 km distance could add to cumulative noise impacts),
» The layout of the Wind farm in relation to the potential sensitive receptors (including the consideration of the buffer zones),
» Prevailing wind conditions, and
» Surrounding environment, and how it responds to increased wind speeds in terms of noise generation (wind induced).

In addition, the exact locations of the various Wind Turbine Generators (WTGs) will only be defined during the EIA phase, and only then can their noise impact be modelled in detail.

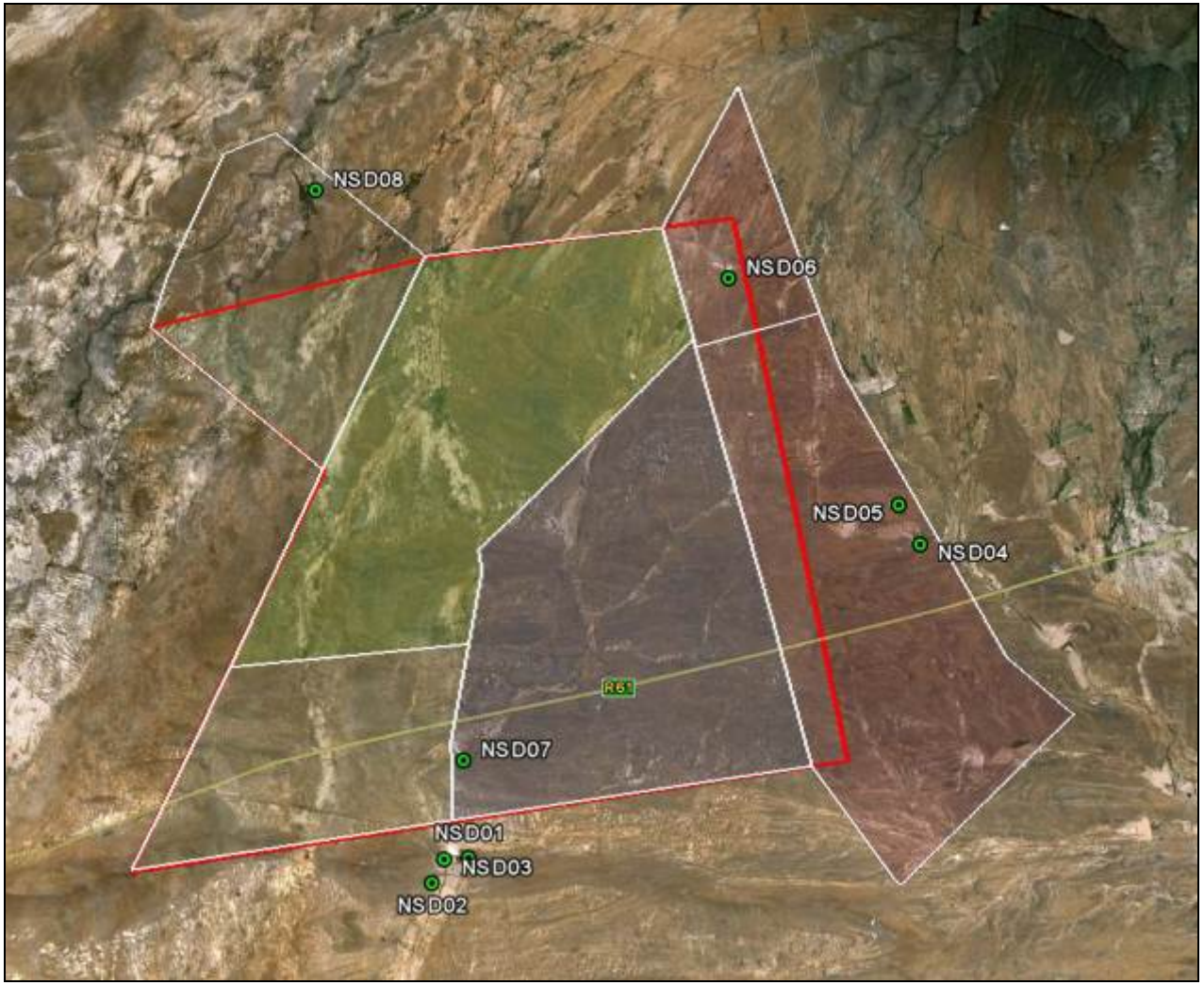


Figure 8.4: Aerial Image indicating potential Noise-sensitive developments (green dots) (*Note: these have been identified at a desk-top level and will be ground-truthed and confirmed in the EIA phase*)

Issue	Nature of Impact	Extent of Impact	'No go' areas
Noise impacts associated with the operation of the wind farm	The noise will be a combination of the cumulative effects of up to 150 wind turbines operating at night. Based on the preliminary impact estimations (as detailed in the noise specialist report contained within Appendix L) there are potential noise-sensitive developments (NSD) within the potential area of influence. This, however, needs to be confirmed through detailed modelling of the preliminary layout in the EIA phase of the process.	Regional (i.e. beyond the site boundaries). The noise could impact on receptors within the potential area of influence (worst case scenario – wind blowing from wind farm towards receptor).	An appropriate buffer around identified sensitive receptors- to be confirmed in the EIA phase

Gaps in knowledge & recommendations for further study:

Limitations:

No layout was provided at this stage of the study. Conceptual scenarios were therefore modelled to illustrate the potential spatial extent of noise impacts that wind turbines may have on a potential receptor.

Recommendations:

It is recommended that the potential noise impact associated the proposed Wind farm be investigated in more detail in the Environmental Impact Assessment phase. The following information is considered critical:

» The prevailing night-time background ambient noise levels,
» The available meteorological data,
» The exact locations of the various WTGs in the Wind farm,
» The full specifications of the WTGs, and
» The confirmation of the Noise-sensitive developments.

Potential Social Impacts:

The potential positive impacts associated with the operational phase relate to the creation of employment opportunities and the promotion of clean, renewable energy. The potential negative impacts are linked to the impact on the rural sense of place and scenic integrity of the landscape. These impacts can in turn impact on the tourism potential of the area.

Social change is recognised as a natural and on-going process, however, it is important to recognize and understand that projects have the potential to influence and alter both the rate and direction of social change. It is, therefore, important to recognize and understand that the development and implementation of projects can result in specific social changes (both positive and negative) as opposed to merely being aware that development per se will be accompanied by social change.

Social impacts can be defined are the consequences to human populations of any public or private actions (these include policies, programs, plans and or projects) that alter the way in which people live, work, play relate to one another, organise to meet their needs and generally live and cope as members of society. These impacts are felt at various levels, including, individual, family or household, community and organisation or society level (Vanclay, 2002)20.

Categories of social impacts

» **People's way of life** – how people live, work, play and relate to other people on a day-to-day basis;
» **Their culture** – shared beliefs, customs, values, and language or dialect;
» **Their community** – its cohesion, stability, character, services and facilities;
» **Their political system** – extent to which people are able to participate in decisions affecting their lives, the level of democratization and the resources available;
» **Their environment** – quality of the natural environment in which people live, including the air and water people use; the availability and quality of the food they eat; the level of hazard or risk, dust and noise they are exposed to; the adequacy of sanitation, their physical safety and their access and control over resources;
» **Their health and well-being** – health is defined as a state of complete physical, mental, social and spiritual well-being and not merely the absence of disease or infirmity;

20 Vanclay, F. 2002. Conceptualising Social Impacts. Environmental Impact Assessment Review, 22. 183-221.

» **Their personal and property rights** – particularly in cases where people are economically affected, or experience personal disadvantage, which may include a violation of their civil liberties.
» **Their fears and aspirations** – fears and perceptions about their safety and well-being and the future of their community, and their hopes for their future and the future of their children and the community.

Issue	Nature of Impact	Extent of Impact	'No go' areas
Formulating appropriate labour recruitment strategies, specifically bearing in mind the need for extensive training with regard to the local communities, and setting appropriate local training and employment targets	Influx of people seeking employment	Local-Regional	N/A
Potential impacts on existing tourism and tourism potential of the area	Visual impacts on tourists visiting the study area	Local-regional	N/A
Potential visual and sense of place impacts on existing receptors, including nearby rural residences.	Impact closely linked to visual impacts, associated with turbines and associated infrastructure proposed.	Local-regional	N/A
Impact on local farmers	Potential stock losses, potential damage to water and other farm infrastructure, potential damage to roads by heavy equipment and increased traffic volumes, potential impact on farming operations and loss of productive land.	Local	N/A
Creation of opportunities to local business during the operational phase, including but not limited to, provision of security, staff transport, and other services	(Positive impact)	Local, Regional and National	N/A
Potential up and down-stream economic opportunities for the local, regional and national economy	(Positive impact)	Local, Regional and National	N/A
Provision of a clean, renewable energy source for the national grid	(Positive impact)	Local, Regional and National	N/A

Gaps in knowledge & recommendations for further study:

Limitations:

The information presented in the Social Scoping level study is based on available desktop sources only. With regard to the study area, the amount of relevant literature available is limited. Baseline information presented in this report will be supplemented and amended by information obtained from interviews with key local officials and community members during field interviews envisaged as part of the EIA phase.

» Demographic data

The demographic data used in the study is largely based on the 2001[21] Census. While this data does provide useful information on the demographic profile of the affected area, the data are dated and should be treated with care.

Recommendations:

Methodology to be undertaken for the EIA phase:

» Review of existing project information, including the Planning and Scoping Documents;
» Collection and review of reports and baseline socio-economic data on the area (IDPs, Spatial Development Frameworks etc.);
» Site visit and interviews with key stakeholders in the area including local land owners and authorities, local community leaders and councillors, local resident associations and residents, local businesses, community workers etc;
» Identification and assessment of the key social issues and opportunities;
» Preparation of Draft Social Impact Assessment (SIA) Report, including identification of mitigation/optimization and management measures to be implemented.
» Finalisation of SIA Report.

The following typical, generic project information is required in order to inform the Social Impact Assessment (Including all related infrastructure such as transmission lines, access roads, office and warehouse components):

» Operating budget per annum;
» Total number of people employed;

[21] The last comprehensive national census is South Africa was conducted in 2001. The census provided demographic and socio-economic data from National to Municipal Ward level. In 2007 a large-scale Community Survey was conducted in all the provinces of South Africa. A sample population (949 105 people) and households (246 618) were enumerated and the results were then weighted to produce the final data sets. The main objective of the survey was to provide demographic and socio-economic data National to Municipal level only. The next full national census was undertaken in 2011. The results of this study are not yet available.

- Breakdown in terms of skills levels (see above);
- Annual wage bill;
- Typical activities associated with the operational phase;
- Information on opportunities for skills development and training;
- Typical lifespan of proposed wind farm;
- Information on the lease / rental agreements with local landowners and or communities, specifically with regard to issues relating to compensation for damage to infrastructure and loss of livestock etc. This information is required so as to indicate how local landowners and communities stand to benefit from the project.

CONCLUSIONS CHAPTER 9

The site selection process, undertaken by Eskom Holdings SOC (State owned Company) Limited and Savannah Environmental, has identified a site (as assessed in this draft scoping report) west of Aberdeen within the Camdeboo Local Municipality in the Eastern Cape, for the establishment of a commercial wind farm. The facility is proposed to accommodate **between 100 and 150 appropriately spaced wind turbines** over an extent of approximately **8 198 hectares** for the purpose of electricity generation. The total generating capacity of the proposed facility will be **up to 200 MW**. The facility will be referred to as the **Aberdeen 200 MW Wind Farm**.

The Scoping Study for the proposed **Aberdeen 200 MW Wind Farm** west of Aberdeen in the Eastern Cape Province has been undertaken in accordance with the EIA Regulations published in Government Notice 33306 of GN R543, R544, R545 and R546 (18 June 2010, as amended), in terms of Section 24(5) of the National Environmental Management Act (NEMA; Act No 107 of 1998). This project was registered with the National Department of Environmental Affairs under application reference number **12/12/20/2211**.

This Draft Scoping Report is aimed at detailing the nature and extent of this facility, identifying potential issues associated the proposed 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) have been identified for consideration within the EIA process.

The conclusions and recommendations of this Draft Scoping Report are the result of limited on-site inspections, desk-top evaluations of impacts identified by specialists, and the parallel process of public participation. A summary of the conclusions of the evaluation of the potential impacts identified to be associated the proposed wind farm is provided below. Recommendations regarding investigations required to be undertaken within the EIA are provided within the Plan of Study for EIA, contained within Chapter 10 of this report.

9.1. Conclusions drawn from the Evaluation of the Proposed Site for Development of the proposed Wind Farm

The location of the proposed area for the development of the Aberdeen 200MW Wind Farm (~8 198 ha in extent) includes following farm portions, which are located west of the town of Aberdeen (refer to Figure 9.1):

» Portion 3 of Sambokdoorns 92
» RE of Portion 4 of Sambokdoorns 92
» RE of Sambokdoorns 92
» Portion 1 of Klipdrift 73
» Portion 2 of Farm 94
» RE of Portion 2 of Farm 94

The wind energy facility is proposed to have a generating capacity of up to 200 MW and accommodate between 100 and 150 wind turbines appropriately spaced to make use of the wind resource on the site. In identifying and evaluating impacts associated with the proposed wind farm, it has been assumed that although during operation, the area affected will comprise between 150 and 200 turbines (depending on which turbine types are ultimately chosen by the developer), access roads and a substation(s), during construction much of the approximately 8 198 ha of the proposed site could suffer some level of disturbance[22]. However, once construction is complete, only a small portion of this area (estimated at approximately 10%) will be permanently impacted by infrastructure associated with the wind energy facility.

General potential issues identified through this scoping study associated with the proposed Aberdeen 200MW Wind Farm west of Aberdeen are summarised in Tables 9.1 and 9.2.

[22] It must be noted that the power line between the wind farm and the grid at the Droeriver Substation near Beaufort West will be assessed in a separate EIA process, which is currently in the pre-application phase.

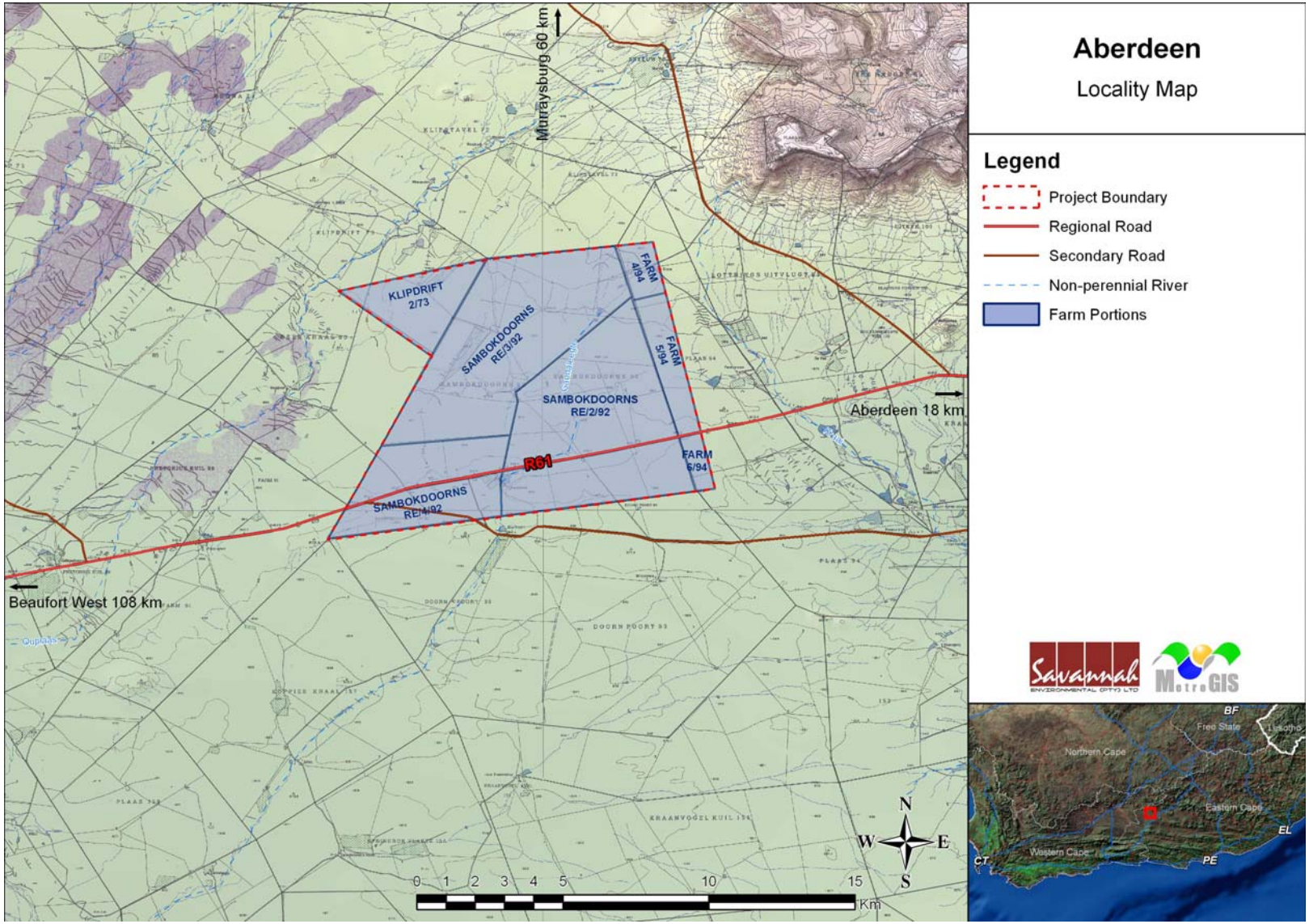


Figure 9.1: Locality map indicating project boundary for the establishment of the Aberdeen 200MW Wind Farm

Table 9.1: Potential impacts associated with the Construction/ Decommissioning Phase with the proposed Aberdeen 200MW Wind Farm

Impacts resulting from the Construction/ Decommissioning Phase	Positive /Negative Impact	Extent
Potential visual impacts associated with the construction phase	-	L
Potential visual impact of the construction of ancillary infrastructure on observers in close proximity	-	L
Loss of agricultural land	-	L
Soil degradation	-	L
Soil erosion	-	L
Physical Soil Disturbance	-	L
Impacts on Current Land Use	-	L
Fragmentation of populations of affected species	-	L
Reduction in area of occupancy of affected species	-	L
Loss of genetic variation within affected species	-	L-R
Negative change in conservation status of habitat	-	L
Increased vulnerability of remaining portions to future disturbance	-	L
General loss of habitat for sensitive species	-	L
Loss in variation within sensitive habitats due to loss of portions of it	-	L
General reduction in biodiversity	-	L
Increased fragmentation (depending on location of impact)	-	L
Disturbance to processes maintaining biodiversity and ecosystem goods and services	-	L
Loss of ecosystem goods and services	-	L
Loss of indigenous vegetation	-	L
Change in vegetation structure leading to change in various habitat characteristics	-	L
Change in plant species composition	-	L
Change in soil chemical properties	-	L

Impacts resulting from the Construction / Decommissioning Phase	Positive / Negative Impact	Extent
Loss of sensitive habitats	-	L
Loss or disturbance to individuals of rare	-	L
Endangered, endemic and/or protected species	-	L
Fragmentation of sensitive habitats	-	L-R
Change in flammability of vegetation, depending on alien species	-	L
Hydrological impacts due to increased transpiration and runoff	-	L
Impairment of wetland function	-	L
Loss of ecosystem function	-	L
Loss of habitat for threatened flightless fauna	-	L-R
Fragmentation of habitat for threatened/protected terrestrial fauna	-	L-R
Loss of individuals of threatened/protected terrestrial fauna	-	L-R
Reduction in area of occupancy of affected terrestrial fauna	-	L-R
Loss of genetic variation within affected species of terrestrial fauna	-	L-R
Impacts on biodiversity amongst terrestrial fauna	-	L-R
Impacts on sensitive habitats for terrestrial fauna	-	L-R
Impacts on ecosystem function for terrestrial fauna	-	L-R
Secondary and cumulative impacts on fauna	-	L-R
Increased loss of soil	-	L
Loss of or disturbance to indigenous wetland vegetation	-	L
Loss of sensitive wetland habitats	-	L
Loss or disturbance to individuals of rare, endangered, endemic and/or protected species that occur in wetlands	-	L
Fragmentation of sensitive habitats	-	L
Impairment of wetland function	-	L

Impacts resulting from the Construction / Decommissioning Phase	Positive / Negative Impact	Extent
Change in channel morphology in downstream wetlands, potentially leading to further loss of wetland vegetation	-	L
Reduction in water quality in wetlands downstream of road	-	L
Disturbance on avifauna by construction and maintenance activities	-	L
Habitat loss for avifauna as a result of destruction, disturbance and displacement	-	L
Destruction of foraging habitat for bats	-	R
Destruction of roosts for bat species	-	R
Impacts on Palaeontology	-	L
Pastoralism (Stone Artefacts)	-	L
Human Remains	-	L
Rock Art (Paintings and Engravings)	-	L
Noise impacts due to construction equipment	-	L
Noise impacts due to blasting (if required)	-	L
Noise impacts due to construction traffic	-	L
Formulating appropriate labour recruitment strategies, specifically bearing in mind the potential of opportunistic labour in-migration	+	L-N
The formulation of suitable training strategies, specifically bearing in mind the generally very low education and skills levels in the local area	+	L-N
The appropriate siting of the construction camp	-	L-N
Adequate on-site management of construction crews	-	L
The provision of adequate services and facilities for construction crews	-	L
Managing health risks associated with large groups of construction workers, including the spread of STDs, HIV/Aids and TB	-	L-N
Job creation	+	L-N
Increase in construction activity due to the proposed construction of the wind farm	-	L

Impacts resulting from the Construction / Decommissioning Phase	Positive / Negative Impact	Extent
Crime	-	L-N
Traffic	-	L
Impact on local farmers in the area	-	L

L **Local** R **Regional** N **National** I **International**

Table 9.2: Potential impacts associated with the Operational Phase with all three phases of the proposed Aberdeen 200MW Wind Farm

Impacts resulting from the Operational Phase	Positive / Negative Impact	Extent
The visibility of the facility to, and potential visual impact on farms and homesteads in close proximity to the proposed wind farm and within the region.	-	L
The potential visual impact of the facility on the visual character of the landscape and sense of place of the region.	-	L
The visibility of the facility to, and the potential visual impact on scenic and sensitive topographic features within the region, specifically the Kamdeboo mountains.	-	L
The potential visual impact of the facility on tourist routes, tourist destinations and tourist potential of the region.	-	L
The potential visual impact of shadow flicker on observers residing on or in close proximity to the proposed wind farm.	-	L
The potential visual impact of ancillary infrastructure (i.e. the substation, the internal access roads, the borrow pits, the office / workshop and the visitor centre) on observers in close proximity to the proposed wind farm.	-	L
The potential visual impact of operational, safety and security lighting of the facility at night on observers in close proximity to the proposed wind farm.	-	L
Potential cumulative visual impacts of the proposed wind farm.	-	L
The visibility of the facility to, and potential visual impact on farms and homesteads in close proximity to the proposed wind farm and within the region.	-	L
Collisions of birds with turbines	-	R
Habitat loss for Avifauna as a result of destruction, disturbance and displacement	-	L
Impacts of associated infrastructure on Avifauna	-	L-R
Bat mortalities due to blade collisions and barotrauma during foraging	-	R
Bat mortalities due to blade collisions and barotrauma during migration	-	R
Built environment	-	L
Cultural landscapes and sense of place	-	Unknown
Noise impacts associated with the operation of the wind farm	-	R
Formulating appropriate labour recruitment strategies, specifically bearing in mind the need for extensive training with regard to the local communities, and setting appropriate local training and employment targets	-	L-R

Impacts resulting from the Operational Phase	Positive / Negative Impact	Extent
Potential impacts on existing tourism and tourism potential of the area	-	L-R
Potential visual and sense of place impacts on existing receptors, including nearby rural residences.	-	L-R
Impact on local farmers	-	L
Creation of opportunities to local business during the operational phase, including but not limited to, provision of security, staff transport, and other services	+	L-N
Potential up and down-stream economic opportunities for the local, regional and national economy	+	L-N
Provision of a clean, renewable energy source for the national grid	+	L-N

L **Local** R **Regional** N **National** I **International**

The majority of potential impacts identified to be associated with the construction and operation of the proposed wind farm are anticipated to be localised and restricted to the proposed site. No environmental fatal flaws were identified to be associated with the site at this stage in the process. However, areas of potential sensitivity were identified through the scoping phase. These areas of sensitivity are illustrated in the sensitivity map included as Figure 9.2.

The potentially sensitive areas/environmental features that have been identified include:

» Areas of visual exposure within (but not restricted to) 10 km of the proposed wind energy facility site such as homesteads and observers travelling along major and gravel roads,
» Potentially sensitive noise receptors as indicated in Figure 9.2 of this report,
» Areas of wetlands and watercourse sensitivity as indicated in Figure 9.2 of this report,
» Areas of bat sensitivity as indicated in Figure 9.2.

The findings of the Draft Scoping Report do not, therefore, identify any portion of the proposed study sites as of "high sensitivity" prohibiting the development. However, bat, avifauna, ecological and faunal sensitivity can only be confirmed in the EIA phase through detailed field investigations by the various specialists.

The proposed design of the wind farm (i.e. wind turbines and other infrastructure) can be based on the full extent of the site, and therefore utilise the most technically optimal positions on the broader site to the fullest extent. This recommendation does, however, require that due cognisance is taken of the recommendations outlined in Chapter 8 and above (as well as within individual specialist reports) regarding sites of potential moderate to high sensitivity. Understanding which area of the site would be least impacted by the development of such a facility, Eskom should prepare the detailed infrastructure layouts for consideration within the EIA phase.

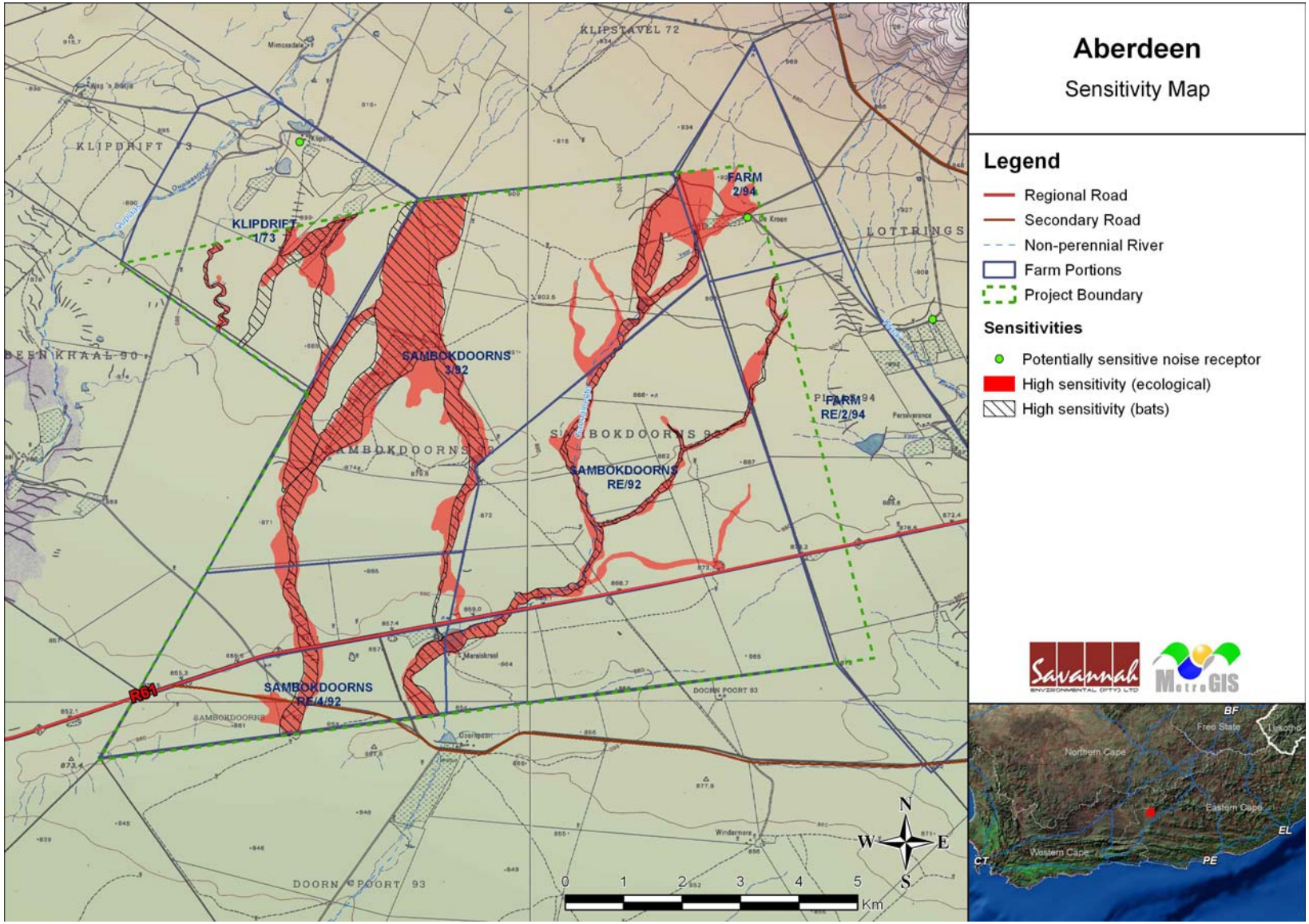


Figure 9.2: Environmental Sensitivity Map for the proposed Aberdeen 200MW Wind Farm

9.2. Potential Benefits of the Proposed Aberdeen Wind Farm

At present, South Africa is in the infancy stage of exploiting the benefits from renewable energy and from achieving a considerable market share in the renewable energy industry. South Africa's electricity supply remains heavily dominated by coal based power generation, with the country's significant renewable energy potential largely untapped to date.

Through research, the viability of a wind farm has been established, and Eskom proposes that between 100 and 150 turbines can be established as part of the Aberdeen 200MW Wind Farm west of Aberdeen. Potential benefits associated with the proposed wind farm development include:

» **Increased energy security:** The current electricity crisis in South Africa highlights the significant role that renewable energy can play in terms of supplementing the power available. 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.
» **Natural Resource saving:** Conventional coal-fired power plants are major consumers of water during cooling processes and power generation process. It is estimated that the achievement of the targets in the Renewable Energy White Paper will result in water savings of approximately 16.5 million kilolitres, when compared with wet-cooled conventional coal-fired power stations. This translates into a revenue saving of R26.6 million. As an already water stressed nation, it is critical that South Africa engages in a variety of water conservation measures, particularly as the detrimental effects of climate change on water availability are expected to be experienced in the future.
» **Exploitation of our renewable energy resource:** At present, valuable national resources (including biomass by-products, solar insulation and wind) remain largely unexploited within South Africa. The use of these energy flows will strengthen energy security within the country through the development of a diverse energy portfolio.
» **Particulate emission avoidance:** The release of by-products from fossil fuel burning for electricity generation has a particularly hazardous impact on human health through impacts on air quality, and contributes to ecosystem degradation. Renewable energy generation is not associated with such emissions to air.
» **Climate friendly development:** The uptake of renewable energy offers the opportunity to address energy needs in an environmentally responsible manner, contributing to the mitigation of climate change through the reduction of greenhouse gas (GHG) emissions. South Africa as a nation 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. The recent

application for a world bank loan to finish the Medupi Power Station was opposed by international NGOs on the basis that South Africa's grid is 'dirty' and without significant renewables.

» **Support for international agreements and enhanced status within the international community:** 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.
» **Employment creation:** The sale, development, installation, maintenance and management of renewable energy facilities have significant potential for job creation on a local scale as well as 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 an opportunity to establish a new industry within the South African economy.
» **Protecting the natural foundations of life for future generations:** Actions to reduce South Africa's disproportionate carbon footprint can play an important part in ensuring the country's role in preventing dangerous anthropogenic climate change; thereby securing the natural foundations of life for generations to come.

These and other potential benefits will be assessed in more detail in the EIA phase of the process.

PLAN OF STUDY FOR ENVIRONMENTAL IMPACT ASSESSMENT CHAPTER 10

A detailed description of the nature and extent of the proposed Aberdeen 200MW Wind Farm and associated infrastructure, details regarding the Scoping Phase followed, as well as the issues identified and evaluated through the Scoping phase (to date) have been included in this Draft Scoping Report. This section of the report provides the context for a Plan of Study for Environmental Impact Assessment (EIA).

The Plan of Study describes how the EIA Phase for the proposed wind energy facility project will proceed. The EIA Phase of the study includes detailed specialist studies for those impacts recorded to be of significance as well as on-going public consultation. The key findings of the Scoping Phase (which includes inputs from authorities, the public, the proponent and the EIA specialist team) are used to inform the Plan of Study for EIA, together with the requirements of the NEMA EIA Regulations and applicable guidelines.

10.1. Aims of the EIA Phase

The EIA Phase will aim 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's are afforded the opportunity to participate, and that their issues and concerns are recorded.

The EIA will address potential environmental impacts and benefits (direct, indirect and cumulative impacts) associated with all phases of the project including design, construction, operation and decommissioning, and will aim to provide the environmental authorities with sufficient information to make an informed decision regarding the proposed project. All identified feasible alternatives (including the 'do nothing' alternative) will be assessed.

10.2. Authority Consultation

Consultation with the regulating authorities (i.e. DEA and Eastern Cape DEDEA) will continue throughout the EIA process. On-going consultation will include the following:

» Submission of a Draft Scoping Report to Eastern Cape DEDEA and other relevant Organs of State for review and comment. A 40-day review period will be allowed as per the requirements of NEMA.
» Submission of a Final Scoping Report to DEA following a 30-day public review period.
» Submission of a Draft EIA Report to Eastern Cape DEDEA and other relevant organs of State for review and comment. A 40-day review period will be allowed as per the requirements of NEMA.
» Submission of a Final EIA Report to DEA following a 30-day public review period.
» An opportunity to visit and inspect the site.

10.3. Consideration of Alternatives

The following feasible project alternatives have been identified through the scoping study and will be investigated in the EIA:

» **The 'do nothing' alternative:** Eskom does not establish the Aberdeen 200 MW Wind Farm (maintain status quo).
» **Site-specific alternatives:** in terms of actual turbine positions and positions of the associated infrastructure on the site (i.e. turbine locations, access roads, substation/s, etc. over an 8 198 ha area).

10.4. Assessment of Potential Impacts and Recommendations regarding Mitigation Measures

Table 10.1: Summary of the issues which require further investigation within the EIA phase and activities to be undertaken in order to assess the significance of these potential impacts

Issue	Activities to be undertaken in order to assess significance of impacts	Specialist
Impact on Ecology, flora and fauna	The following assessments are required to be done during the EIA phase in order to properly assess potential impacts on terrestrial fauna by the proposed wind farm: » The potential for presence of species of concern must be confirmed. This must be done by assessing habitat suitability for those species that have been assessed as potentially occurring in the area, through a field survey of the study area. » The presence and distribution of watercourses and drainage lines on site must be confirmed in the field. This will be done primarily using aerial photograph interpretation, but will be confirmed in the field using topographic and floristic indicators.	David Hoare of David Hoare Consulting cc
Impacts on avifauna	The specialist study to be undertaken in the EIA phase will include the following: » All identified issues will be investigated in more detail during the EIA phase, and rated according to the prescribed criteria. » Alternatives will be considered in more detail. » Landscape factors relevant to this study will be investigated further. » Suitable mitigation measures will be recommended for all issues identified as significant. » The extent to which collision and displacement impacts actually occur will need to be determined through rigorous pre and post construction monitoring as outlined in Jenkins *et al* (2011).	Andrew Pearson of Endangered Wildlife Trust
Impacts on bats	A detailed site visit will have to be conducted as part of the EIA level investigation and the following parameters should be investigated: » Study the habitat types and make predictions of the species of bats that may reside and forage in different parts of the proposed wind farm site. » Important roosts and geographical features that will attract bats (for foraging and/or roosting) are designated as sensitive and buffered, trying to minimise operational impacts of each turbine on the local bats. » Mist nets are erected at strategically important localities where the chances of catching a bat is the highest, while the site is surveyed for nocturnal bat activity by transecting it with a bat	Werner Marais of Animalia

Issue	Activities to be undertaken in order to assess significance of impacts	Specialist
	detector (where allowed by terrain). » A bat detector is a device that can record ultrasound calls of bats, which will be later analysed and interpreted by the specialist on computer to determine species and activity.	
Impacts on geology, soils and agricultural potential study	A detailed site visit will have to be conducted as part of the EIA level investigation and the following parameters should be investigated: » Soil distribution (classification) on the site; » Extent of degradation due to current land use (such as overgrazing); » Erosion status and erodibility of the soils on the site; and » Mitigation measures to arrest current impacts and manage future impacts associated with the development.	Johan van der Waals of Terrasoil Science
Visual impacts	The Plan of Study for EIA is as follows: » The following factors must be included in the EIA study: * Determine Visual Distance/Observer Proximity to the facility * Determine Viewer Incidence/Viewer Perception * Determine the Visual Absorption Capacity of the landscape * Determine the Visual Impact Index » The above exercise should be undertaken for the core wind energy facility as well as the ancillary infrastructure, as these structures (i.e. the substation, the internal access roads, the borrow pits, the office / workshop and the visitor centre) are envisaged to have varying levels of visual impact at a more localised scale. » The site-specific issues and potential sensitive visual receptors should be measured against this visual impact index and be addressed individually in terms of nature, extent, duration, probability, severity and significance of visual impact. » In addition, cumulative visual impact should be addressed, as well as suggested mitigation measures for all identified impacts (if any).	Lourens du Plessis of MetroGIS
Impacts on heritage sites	The specialist study to be undertaken in the EIA phase will include: » A full phase 1 archaeological impact assessment be conducted to establish the range and importance of the exposed and in situ archaeological heritage materials and features, the potential impact of the development and to make recommendations to minimize possible damage to these sites.	Celeste Booth of the Department of Archaeology, Albany Museum

Issue	Activities to be undertaken in order to assess significance of impacts	Specialist
	» It is recommended that a palaeontology study be conducted in the EIA phase	
Noise impacts	It is recommended that the potential noise impact associated with the Aberdeen Wind Energy Facility be investigated in more detail in the Environmental Impact Assessment phase. The following information is considered critical: » Site visit to measure the site-specific background ambient sound levels and to confirm the presence of the identified receptors. » Using the data (proposed processes, noise characteristics of the selected equipment, and locations of the WTG) as provided by the project developer, the predicted impact of the wind energy facility on potentially sensitive receptors will be predicted using the CONCAWE method as stipulated by SANS 10357:2004 for both the construction and operational phases. » Using the calculated noise levels at the identified sensitive receptors, the projected significance of the wind energy facility (whether construction or operational) will be determined using the criteria as proposed (subject to possible changes after any stakeholder input. » The prevailing night-time background ambient noise levels, » The available meteorological data, » The exact locations of the various WTGs in the wind farm, » The full specifications of the WTGs, » The confirmation of the Noise-sensitive developments, and; » An overview of the equipment, processes and schedules for the construction phase.	Morné de Jager of M^2 Environmental Connections
Social Impact Assessment	The identification and assessment of social impacts will be guided by the specialist SIA Guidelines. The specialist study will include the following activities: » On-going identification of key landowners, stakeholders and interested & affected parties; » Meetings and interviews with key stakeholders and interested & affected parties; » Identification and assessment of key social issues based on feedback from key interested and affected parties. » Recommendations regarding mitigation/optimisation and management measures to be implemented.	Tony Barbour (Environmental Consultant and Researcher)

10.5. Methodology for the Assessment of Potential Impacts

Direct, indirect and cumulative impacts of the above issues, as well as all other issues identified will be assessed in terms of the following criteria:

- The **nature**, which shall include a description of what causes the effect, what will be affected and how it will be affected.
- The **extent**, wherein it will be indicated whether the impact will be local (limited to the immediate area or site of development) or regional:
  - local extending only as far as the development site area – assigned a score of 1;
  - limited to the site and its immediate surroundings (up to 10 km) – assigned a score of 2;
  - will have an impact on the region – assigned a score of 3;
  - will have an impact on a national scale – assigned a score of 4; or
  - will have an impact across international borders – assigned a score of 5.
- The **duration**, wherein it will be 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 shall describe the likelihood of the impact actually occurring. Probability will be 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 shall be determined through a synthesis of the characteristics described above (refer formula below) and can be assessed as low, medium or high.
» the **status**, which will be described as either 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: Medium (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 Eskom Holdings SOC Limited has the responsibility to avoid or minimise impacts, and plan for their management (in terms of the EIA Regulations), the mitigation of significant impacts will be discussed. Assessment of impacts with mitigation will be made in order to demonstrate the effectiveness of the proposed mitigation measures.

The results of the specialist studies and other available information will be integrated and synthesised by the Savannah Environmental project team. A single EIA report will be compiled for all phases of the proposed project within which each phase will be assessed separately. In addition, the cumulative impacts associated with the proposed development will be assessed. The EIA Report will include:

» **detailed description** of the proposed activity
» a description of the property(ies) on which the activity is to be undertaken and the location of the activity on the property(ies)

- a description of the **environment that may be affected by the activity** and the manner in which the physical, biological, social, economic and cultural aspects of the environment may be affected by the proposed activity
- details of the **public participation process** conducted, including:
  - steps undertaken in accordance with the plan of study for EIA;
  - a list of persons, organisations and organs of state that were registered as interested and affected parties;
  - a summary of comments received from, and a summary of issues raised by registered interested and affected parties, the date of receipt of these comments and the response to those comments; and
  - copies of any representations, objections and comments received from registered interested and affected parties
- a description of the **need and desirability** of the proposed project and identified potential alternatives to the proposed activity, including advantages and disadvantages that the proposed activity or alternatives may have on the environment and the community that may be affected by the activity
- an indication of the methodology used in determining the **significance** of potential environmental impacts
- a description and comparative **assessment of all alternatives** identified during the environmental impact assessment process
- a summary of the findings and recommendations of **specialist reports**
- a description of all environmental issues that were identified during the environmental impact assessment process, an assessment of the significance of each issue and an indication of the extent to which the issue could be addressed by the adoption of mitigation measures
- an assessment of each identified potentially significant impact
- a description of any assumptions, uncertainties and gaps in knowledge
- an environmental **impact statement** which contains:
  - a summary of the key findings of the environmental impact assessment; and
  - a comparative assessment of the positive and negative implications of the proposed activity and identified alternatives
- a draft **environmental management programme (EMP)**
- copies of specialist reports

The draft EIA Report will be released for a 30-day public review period. The comments received from I&APs will be captured within a Comments and Response Report, which will be included within the final EIA Report, for submission to the authorities for decision-making.

10.6. Public Participation Process

A public participation process will be undertaken by Sustainable Futures ZA in conjunction with Savannah Environmental in accordance with the requirements of the EIA Regulations. Consultation with key stakeholders and I&APs will be on-going throughout the EIA process. Through this consultation process, stakeholders and I&APs will be encouraged to provide input to the project, and to comment on the findings of the EIA process.

In order to accommodate the varying needs of stakeholders and I&APs within the study area, as well as capture their inputs regarding the project, various opportunities will be provided for stakeholders and I&APs to be involved in the EIA phase of the process, as follows:

» Public meeting (advertised meeting for members of the general public).
» Focus group meetings (pre-arranged and stakeholders invited to attend).
» One-on-one consultation meetings (for example on request by stakeholders or I&APs).
» Telephonic consultation sessions (consultation with various parties from the EIA project team, including the project participation consultant, lead EIA consultant as well as specialist consultants).
» Written, faxed or e-mail correspondence.

The draft EIA report will be made available for public review for a 30-day period prior to finalisation and submission to the DEA for review and decision-making. In order to provide an overview of the findings of the EIA process and facilitate comments, a public meeting will be held during this public review period.

10.7. Key Milestones of the programme for the EIA

The envisaged key milestones of the programme for the EIA phase of the project are outlined in Table 10.2.

Table 10.2: Envisaged key milestones of the programme for the EIA phase of the project

Key Milestone Activities	Proposed completion date[16]
Public review period for Draft Scoping report	17 February 2012 – 18 March 2012
Finalisation of Scoping Report	March 2012
Authority acceptance of the Scoping Report and Plan of Study to undertake the EIA	April 2012
Undertake detailed specialist studies and public	March - June 2012

[16] Indicative dates only

Key Milestone Activities	Proposed completion date[16]
participation process	
Make draft EIA Report and draft EMP available to the public, stakeholders and authorities	June 2012
Finalisation of Environmental Impact Assessment Report	July 2012
Submit Final EIA Report to DEA for review and decision-making	July 2012

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