

PLAN 8 GRAHAMSTOWN WIND ENERGY FACILITY
MAKANA LOCAL MUNICIPALITY
EASTERN CAPE PROVINCE, SOUTH AFRICA

**AMENDMENT OF THE ENVIRONMENTAL AUTHORISATION FOR THE
PLAN 8 GRAHAMSTOWN WIND ENERGY FACILITY
VOLUME 3: REVISED ENVIRONMENTAL MANAGEMENT PROGRAMME**

DEA Reference: 12/12/20/2523/AM2

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REVISIONS TRACKING TABLE



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Name	Responsibility	Signature	Date
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FOREWORD

The necessity to revise this Environmental Management Programme arises from the proposal to amend the Environmental Authorisation for the project to enable larger turbines to be installed on the site and, as a result, to provide total installed generating capacity up to 50% higher than from the smaller approved turbines.

In commenting on the Revised Draft Amendment Report, March 2019, the Department of Environmental Affairs (DEA) wrote:

vi The final amendment report must contain an EMPr reflective of the changes or improvements the proposed application will have on the EA and the previous EMPr.

This Revised EMPr refers to the amended project, as described in the final Amendment Report, May 2019, which is Volume 1 of this submission.

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LIST OF ACRONYMS/ABBREVIATIONS

BA	Basic Assessment
CITES	Convention on International Trade in Endangered Species
CLO	Community Liaison Officer
CSF	Co-ordinating Social Facilitator
DAFF	Department of Agriculture, Forestry and Fisheries
DEA	Department of Environmental Affairs
DEAT	Department of Environmental Affairs and Tourism (now DEA)
DWS	Department of Water and Sanitation (formerly DWA)
DWAF	Department of Water Affairs and Forestry (now DWS)
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
EMP	Environmental Management Plan (now EMPr)
EMPr	Environmental Management Programme
EMS	Environmental Management System
ESO	Environmental Site Officer
GN	Government Notice
GWH	Giga-Watt Hours
I&AP	Interested and Affected Party
IDZ	Industrial Development Zone
IEC	Independent Environmental Consultant
IEM	Integrated Environmental Management
IPP	Independent Power Producer
KPI	Key Performance Indicator
MW	Mega-Watt
NEMA	National Environmental Management Act
NSS	National Scientific Services
OHSA	Occupational Health and Safety Act
PSC	Project Steering Committee
SAHRA	South African Heritage Resources Agency
S&EIA	Scoping and Environmental Impact Assessment
SSC	Species of Special Concern
VP	Vantage Point
WfW	Working for Water

1 INTRODUCTION

1.1 Environmental Management Programmes

The Bill of Rights – Chapter 2 of the Constitution Act (Act No. 108 of 1996 - includes an environmental right (Section 24) according to which, “*everyone has the right to an environment that is not harmful to their health or wellbeing and to have the environment protected for the benefit of present and future generations, through reasonable legislative and other measures that prevent pollution and ecological degradation, promote conservation and the sustainable use of natural resources while promoting justifiable economic and social development*”.

In addition, Section 28 of the National Environmental Management Act (Act No. 107 of 1998) (NEMA) requires, “*every person causing significant pollution or degradation of the environment, to take reasonable measures to prevent it from occurring, continuing or recurring*”. Therefore, in order to promote effective environmental management throughout the lifecycle of a project, it is important that management actions arising from Environmental Impact Assessments (EIAs) are clearly defined and translated into an Environmental Management Programme (EMPr) for the design, construction, operation and decommissioning phases of a project.

According to the Western Cape Department of Environmental Affairs and Development Planning (2005), an Environmental Management Programme (EMPr) can be defined as, “*an environmental management tool used to ensure that undue or reasonably avoidable adverse impacts of the construction, operation and decommissioning of a project are prevented; and that the positive benefits of the project are enhanced*”. The purpose of an EMPr is therefore to:-

- Encourage good management practices through planning and commitment to environmental issues;
- Define how the management of the environment is reported and performance evaluated;
- Provide rational and practical environmental guidelines to:
 - Minimise the extent of environmental impacts and to manage environmental impacts and where possible, to improve the condition of the environment;
 - Prevent long-term or permanent environmental degradation;
 - Comply with all applicable laws, regulations, standards and guidelines for the protection of the environment;
 - Provide guidance regarding method statements which are required to be implemented to achieve environmental specifications;
 - Define the corrective actions which must be taken in the event of non-compliance with the specifications of the EMPr;
 - Describe all monitoring procedures required to identify impacts on the environment, and;
 - Train employees and contractors with regard to environmental obligations.

EMPrs are important tools in the sound environmental management of projects, provided that the specifications are implemented and the user understands the contents of the Programme, and the reasons for the implementation of certain specifications. As such EMPrs then form the backbone of the overall Environmental Management Programme (EMPr) and associated management and monitoring systems as it is defined by Appendix 4 of GN.R326, EIA Regulations 2014, as amended April 2017 (refer to section 1.2 below).

There are essentially four broad categories of EMPrs: Design EMPr, Construction EMPr, Operational EMPr and Decommissioning EMPr. The objectives of these EMPrs are all the same, and include identifying the possible environmental impacts of the proposed activity, and developing measures to minimise, mitigate and manage the negative impacts while enhancing the positive ones. The difference between these EMPrs is related to the different mitigation measures required for the different stages of the project lifecycle. Each category of EMPr is discussed in more detail below.

Design EMPr: The Design EMPr is an integral component of the project life cycle and requires interaction between the design engineers and environmental consultants to ensure that the

engineers are aware of the environmental constraints that they must consider and incorporate into the final design of the project. The format of the Design EMPr is that of a checklist, to ensure that all specifications are included in the design phase. The design phase if a project requires on-going and in-depth discussions between the contractor's design team and the environmental officer. The engineer must be available for on-going discussions with the environmental officer at all stages of design.

Construction EMPr: The Construction EMPr provides specific environmental guidance for the construction phase of a project, where impacts range from those incurred during start-up (site clearing, for example) to construction activities (such as erosion). The Construction EMPr consists of a management system and environmental specifications which contain detailed specifications that need to be undertaken or adhered to by the contractor. Two types of specifications need to be complied with by the contractor; namely; standard and specific. Standard specifications apply to all project components, while specific specifications outline specific instructions for managing and minimising environmental impacts resulting from particular activities. The Construction EMPr must be developed in parallel with the final design stages, and constructive input should be invited from the selected contractor. Sound environmental management is oriented around a pragmatic, unambiguous and enforceable set of guidelines and specifications, and for this reason it is imperative that the contractor, being bound by the EMPr, fully understands it and has had input into its development. Although the contractor tenders on the EMPr that has been approved by the relevant authority, it must also be understood that the EMPr is a dynamic document that is subject to change.

Operational EMPr: The Operational EMPr provides specific guidance related to operational activities associated with a particular development. Operational EMPrs are sometimes referred to as Environmental Management Systems (EMS).

Decommissioning EMPr: As the final phase in the project cycle decommissioning may present positive environmental opportunities associated with the return of the land for alternative use and the cessation of impacts associated with operational activities. However, depending on the nature of the operational activity, the need to manage risks and potential residual impacts may remain well after operations have ceased. Examples of potential residual impacts and risks include contamination of soil and groundwater and old (unserviceable) structures. Decommissioning phase EMPrs are typically encountered within extractive industries such as minerals mining and oil and gas exploration and extraction. It should be noted that, as the proposed wind farm will be operational for at least 25 years, a detailed decommissioning EMPr has not been included in this volume, but will need to be developed closer to the time of decommissioning.

It is widely recognised that there is no standard format for EMPrs. The format needs to fit the circumstances in which the EMPr is being developed and the requirements that it is designed to meet (World Bank, 1999; CSIR, 2002; DEAT 2004b). Additionally, the level of detail in an EMPr varies depending on the size of the project as well as the magnitude of environmental impacts. Section 1.2 below provides an overview of the information that needs to be included in the EMPr based on current South African legislative requirements.

1.2 Contents of the EMPr

The contents of the EMPr must be consistent with the requirements set out in Appendix 4 of GN.R326, EIA Regulations 2014, as amended April 2017, published as Government Notice No R326 in Government Gazette No 40772 17 April 2017, in terms of Chapter 5 of the National Environmental Management, Act No 107 of 1998 (NEMA).

Appendix 4 sets out the content of an environmental management programme (EMPr) as follows:

- 1.(1) An EMPr must comply with section 24N of the Act and include –
 - (a) details of –
 - (i) the EAP who prepared the EMPr; and
 - (ii) the expertise of that EAP to prepare an EMPr, including a curriculum vitae;

- (b) a detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description;
 - (c) a map at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that should be avoided, including buffers;
 - (d) a description of the impact management outcomes, including management statements, identifying the impacts and risks that need to be avoided, managed and mitigated as identified through the environmental impact assessment process for all phases of the development including –
 - (i) planning and design;
 - (ii) pre-construction activities;
 - (iii) construction activities;
 - (iv) rehabilitation of the environment after construction and where applicable post-closure; and
 - (v) where relevant, operation activities;
 - (f) a description of proposed impact management actions, identifying the manner in which the impact management outcomes contemplated in paragraph (d) will be achieved, and must, where applicable, include actions to –
 - (i) avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation;
 - (ii) comply with any prescribed environmental management standards or practices;
 - (iii) comply with any applicable provisions of the Act regarding closure, where applicable; and
 - (iv) comply with any provisions of the Act regarding financial provision for rehabilitation, where applicable;
 - (g) the method of monitoring the implementation of the impact management actions contemplated in paragraph (f);
 - (h) the frequency of monitoring the implementation of the impact management actions contemplated in paragraph (f);
 - (i) an indication of the persons who will be responsible for the implementation of the impact management actions;
 - (j) the time periods within which the impact management actions contemplated in paragraph (f) must be implemented;
 - (k) the mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f);
 - (l) a program for reporting on compliance, taking into account the requirements as prescribed by the Regulations;
 - (m) an environmental awareness plan describing the manner in which—
 - (i) the applicant intends to inform his or her employees of any environmental risk which may result from their work; and
 - (ii) risks must be dealt with in order to avoid pollution or the degradation of the environment; and
 - (n) any specific information that may be required by the competent authority.
- (2) Where a government notice by the Minister provides for a generic EMPr, such generic EMPr as indicated in such notice will apply.

With regard to sub-section 1(1)(c) – the requirement for a map showing proposed infrastructure relative to sensitive sites and buffer zones – it is not helpful to prepare a single map because of the large number of sensitive areas and buffers. Accordingly individual maps have been prepared for each aspect of the site. The series of maps are included in Annexure A to this report. They are also included in the Amendment Report, May 2019.

The Chapters that follow comprise the EMPr for the proposed Plan 8 Grahamstown Wind Energy Project, based on the requirements of prevailing regulations, as detailed above.

2 BACKGROUND INFORMATION

2.1 The Proposed Plan 8 Grahamstown Wind Farm Project

2.1.1. Brief Project Description and Motivation

This section provides a brief description of the proposed amended project. A detailed description of the approved project, for which an Environmental Authorisation was issued in October 2015, is provided in Chapter 2 the *Second Final Amended Environmental Impact Assessment (EIA) Report for the Plan 8 Grahamstown Wind Energy Facility (April 2015)*. A description of the proposed amendments is provided in the final Amendment Report, April 2019 (Volume 1 of this Amendment Application) submission.

Plan 8 Infinite Energy (Pty) Ltd (hereafter Plan 8), a renewable energy company, plans to develop a wind powered electricity generation facility (a wind energy facility (WEF), popularly referred to as a wind farm) approximately 30 km outside of Grahamstown along the N2 in an easterly direction towards East London, in the Eastern Cape Province of South Africa (Figure 2.1 below).

The project will be spread over approximately 2 550 hectares comprising three property parcels in the Makana Local Municipality area. Farm details are as follows:

1. Gilead farm
Gilead farm No361, Division of Albany
SG Code: C 00200000000036100000
2. Tower Hill farm
Coombs Vale farm No 3, Division of Albany
SG code:C 00800000000000300001
3. Peynes Kraal farm
PeynesKraal farm No 362, Division of Albany
SG Code: C 00200000000036200000

The three portions of land are planned to host a total of up to 22 turbines, each with a nominal power output of up to 4.5 megawatts (MW). The total potential generating capacity of the wind farm will therefore be up to 99MW.

The ultimate size of the wind turbines will depend on further technical assessments but will typically consist of turbines with three blades, with rotor diameters of up to 149 metres mounted on a steel or hybrid steel/concrete tower up to 125m high from ground level to the hub of the rotor.

According to Plan 8, the motivation for the proposed project comprises the following potential benefits:

- **Electricity supply**
The establishment of the proposed Plan 8 Grahamstown Wind Energy Facility will contribute to strengthening and stabilising the existing electricity grid for the area, and will aid the government in achieving its goal of a 30% share of all new power generation being derived from Independent Power Producers (IPP).
- **Social upliftment**
The landowners approached by the Applicant to be part of this wind energy project expressed their commitment to the project in the hope that utilisation of portions of their land for wind turbines will be a source of additional income to supplement their farming income. Plan 8 also intends to identify community development projects, in conjunction with local government, local community organisations and stakeholders, which will be implemented with the aim of improving the socio-economic environment in Makana and Ndlambe Local Municipalities and the surrounding areas. These initiatives will at least meet the minimum requirements as

defined by the Department of Energy in their qualification criteria for independent power producers (IPPs) in South Africa.

- **Climate change:**

Due to concerns over the potential impacts of climate change, and the on-going exploitation of non-renewable resources, there is increasing international pressure on countries to increase their share of renewable energy generation. The South African Government has recognised the country's high level of renewable energy potential and has placed targets of 10 000 GWh of renewable energy by 2013. In order to kick start the renewable energy sector in South Africa, a Feed-in Tariff for various renewable energy technologies was established. This system was recently amended to allow developers to submit bids for the price of electricity they would accept for their particular renewable energy installation.

In addition, the proposed project site was selected due to:

- Good wind resources suitable for the installation of a large wind energy facility;
- Proximity to connectivity opportunities such as substations or high voltage (HV) overhead lines traversing the proposed development site;
- The surrounding area is not densely populated;
- There is potential and appetite within the Makana Local Municipality to engage with new technologies and industries.

The term wind energy describes the process by which wind turbines convert the kinetic energy in the wind into mechanical power and a generator can then be used to convert this mechanical power into electricity. Typical turbine subsystems include

- A rotor consisting of three blades, the portion of the wind turbine that collects energy from the wind and converts it into rotational (shaft) energy to turn the generator.
- A nacelle (enclosure) containing a drive train, usually including a gearbox (some turbines do not require a gearbox) and a generator which converts the turning motion of the rotor (mechanical energy) into electricity.
- A tower, to support the nacelle, rotor and drive train> The tower on which a wind turbine is mounted is not only a support structure, but it also raises the wind turbine so that its blades safely clear the ground and so can reach the stronger winds at higher elevations.
- Electronic equipment such as controls, electrical cables, ground support equipment, and interconnection equipment.

Typically, the development of the wind farm is divided into various phases:

- *Pre-feasibility:* Plan 8 conducted surveys to ensure that obvious issues surrounding the project should not impact on the progress and the final acceptance of the project. This includes visits to local authorities, civil aviation authorities, identifying local communities, wind resource evaluation from existing data, grid connectivity, environmental impact assessment, logistical and project phasing requirements.
- *Feasibility:* Plan 8 firmed up the conclusions from the pre-feasibility studies and carried out further, more detailed investigations to establish the actual costs and economic viability of the project by designing the financial model with financial institutions, verifying wind resources by on-site measurement, ensuring the grid connection is economical and feasible in the timeframes of the project, identifying possible off-takers for the electricity. Once the feasibility studies were complete Plan 8 identified which parts of the project will be constructed first. Then, if it is possible to expand the facility, the project will be expanded according to the availability of grid capacity and turbines. There are five construction phases envisaged which will allow for economical implementation of the project.
- *Wind Measurement:* Prior to the establishment of the full facility it will be necessary to erect a number of wind measurement masts to gather wind speed data and correlate these measurements with other meteorological data in order to produce a final wind model of the

proposed project site. Thus far more than a year's worth of wind data has been collected on site.

- *Implementation:* Building a wind farm is divided into three phases namely:
 1. Civil works: An area of 35 m X 25 m needs to be established during the preliminary phase of construction for access to the site during the construction phase by machines (such as bulldozers, trucks and cranes).
 2. Construction: In road terms this involves constructing access roads to each turbine location, excavating and casting concrete turbine foundations, erecting turbines, and making electrical connections between the turbines and the substation, and from the substation to the Eskom power line
 3. Operational: During the period when the turbines are operational, there are only a few crews who carry out routine maintenance requiring only light vehicles to access the site. Only major breakdowns will necessitate the use of cranes, trucks and other heavy machinery.

- *Timing Estimation:*
 1. Preliminary phase = 9 weeks (including 4 weeks to let the foundation concrete achieve its final design strength)
 2. Civil Construction = 8-12 Months (mobilise contractors, set up site compound and batch plant, telephone, water and electricity connections, security fencing, construct access roads and hardstandings, cable trenches, substation compound, excavate for wind turbine generator (WTG) foundations, fix steel and shutters, cast and cure concrete for 22 turbines)
 3. Wind turbines erection = 8 months (in low wind and good weather conditions)
 4. Commissioning and electrical connection = 4 months
 5. Demobilise site compound and clean up = 1 month

- *Refurbishment and rehabilitation of the site after operation*

Wind turbines have a design life of around 25 years, and this is the figure that has been used to plan the life span of a modern wind farm. If refurbishment is economical, the facility life span could be expanded by a further 25 years. Decommissioning of the wind energy facility at the end of its useful life will be undertaken in agreement with the landowners and according to the land use agreement.

2.2 Brief overview of the Environmental Assessment Process followed

The International Association for Impact Assessment (1999) defines an Environmental Impact Assessment (EIA) as, "*the process of identifying, predicting, evaluating and mitigating the biophysical, social, and other relevant effects of development proposals prior to major decisions being taken and commitments made*". The EIA process in South Africa is guided by regulations made in terms of Chapter 5 of NEMA. The EIA regulations, which are reviewed and updated from time to time¹, set out the procedures and criteria for the submission, processing and consideration of and decisions on applications for the environmental authorisation of activities. Since 2010, when the revision of the previous (2006) regulations was conducted, three lists of activities have been published. The first two lists define the activities that require, respectively, a Basic Assessment (applies to activities with limited environmental impacts or within a prescribed geographical area - province), or a Scoping and Environmental Impact Assessment (applies to activities which are significant in extent and duration). A third list is province specific, and lists activities for which environmental authorisation is required if the activities take place in or in the vicinity of certain specified areas, including estuaries, protected or sensitive areas, and areas listed in international conventions such as the Ramsar Convention on Wetlands.

¹ The EIA for the project was conducted in terms of the 2010 EIA Regulations. Regulations prevailing at the time of this Amendment Application are those Gazetted in December 20-14, amended in July 2017

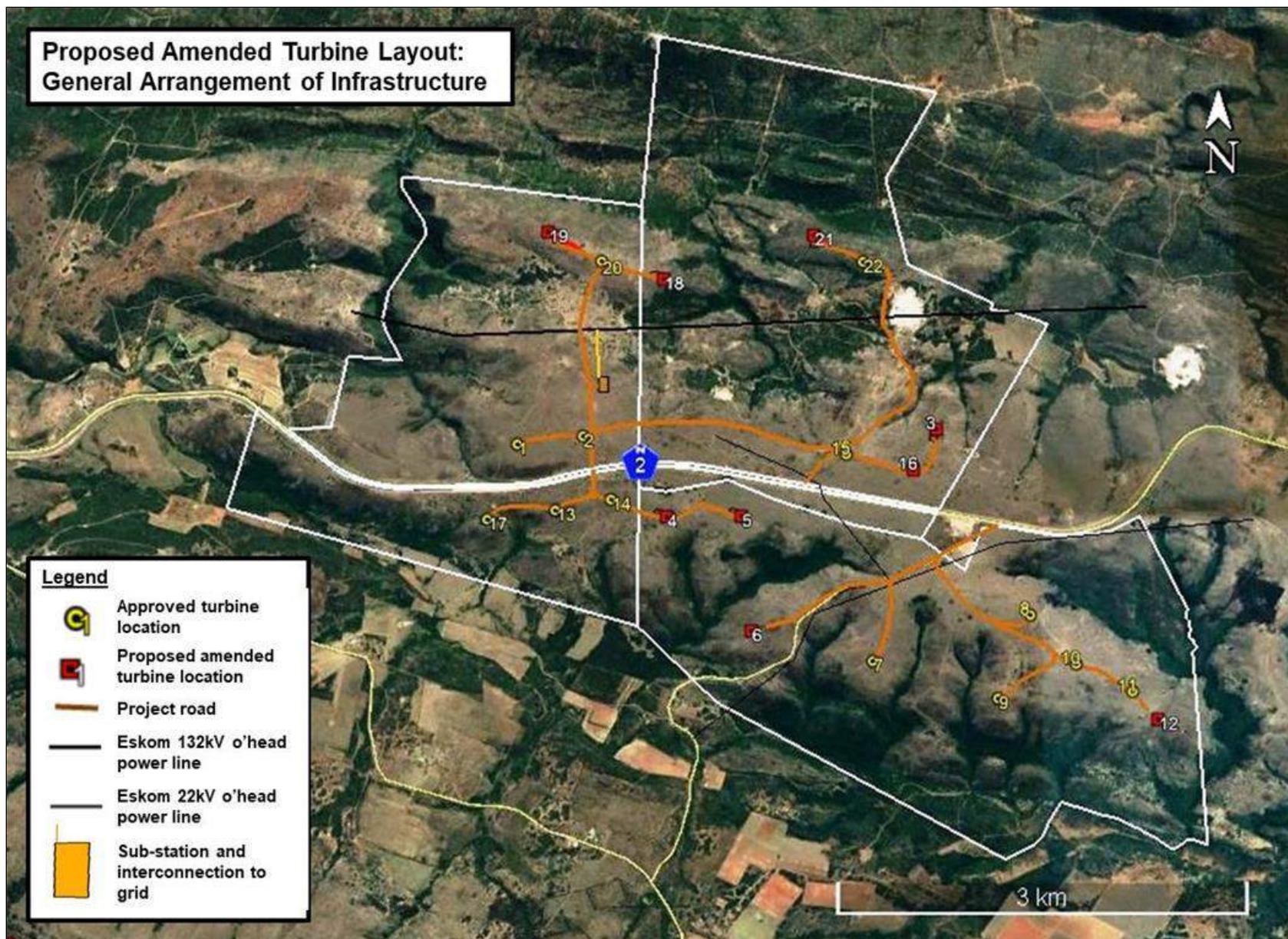


Figure 2-1: General layout of project infrastructure for the Plan 8 Grahamstown Wind Energy Project

The proposed development involved activities that required a full Scoping and EIA. Because the establishment of a large wind energy facility is regarded as having consequences at national level the competent authority that considered and decided on the application for authorisation in respect of the activities was the Department of Environmental Affairs (DEA).

It is important to note that in addition to the requirements for an authorisation in terms of the NEMA, there are additional legislative requirements that must be considered prior to commencing with the activity. Some of these are: the National Heritage Resources Act (Act No 25 of 1999), the National Water Act (Act No 36 of 1998), the Civil Aviation Act (Act No 74 of 1962) as amended, the White Paper on Energy Policy for South Africa (Energy White Paper), the White Paper on Renewable Energy Policy (Renewable Energy White Paper), and the Integrated Energy Plan for the Republic of South Africa (March, 2003).

In terms of the EIA process all reports generated from the environmental studies formed part of a series of documents for the project. The Environmental Scoping Report (CES, January 2012) identified potentially significant environmental impacts and was the first report in the series. *Volume 3: The Second Final Amended Environmental Impact Assessment Report* (CES 2015a) investigated potentially significant environmental issues and recommended appropriate mitigation measures.

The Second Final Amended Environmental Management Programme (EMPr) (CES 2015c), interpreted the findings of the Scoping Report and the EIA Report, and set out project-specific specifications. The EMPr was based on the principles of Integrated Environmental Management (IEM) and is intended to culminate in the adoption of an Environmental Management System (EMS) for the project, based on the ISO 14001 international standards.

Environmental Authorisation (EA) was issued for the project in October 2015 (DEA 2015). Three appeals against the granting of the EA were dismissed by the Minister of Environmental Affairs in September 2016 and March 2017.

2.3 Application for Amendment of the Environmental Authorisation

Plan 8 submitted an application for an amendment of the EA at the beginning of March 2019, to enable the replacement of the approved turbines (each generating up to 3MW) could be replaced by larger machines (each with generating capacity up to 4.5MW), thereby increasing the total capacity of the facility from 66MW to 99MW. The amendment process is governed by Chapter 5 – *Amendment, suspension, withdrawal and auditing of compliance with environmental authorisation and environmental management programme* – of the Environmental Impact Assessment Regulations, 2014, as amended in April 2017.

This Revised EMPr builds on the foundation established by the April 2015 version, and reflects the proposed changes to the project. As required by DEA, the mitigation measures proposed in 2015 are also examined to ensure that they cater for any additional impacts arising from the propose amendment, and that they are still appropriate and in accordance with recent practices and guidelines.

3 EMPR SCOPE AND DEFINITIONS

3.1 Details and Expertise of the Environmental Assessment Practitioner

3.1.1 Details of the EAP

Coastal & Environmental Services (CES) were appointed by the applicant, Plan 8 (Pty) Limited to prepare an Environmental Management Programme (EMPr) that seeks to comply with the EIA regulations. In fulfilment of this requirement, provided below are the details of CES:

Coastal and Environmental Services
 Physical Address: 67 African Street, Grahamstown, 6139
 Postal Address: P.O. Box 934, Grahamstown, 6140
 Telephone: +27 (0)46 622364
 Email: info@cesnet.co.za

3.1.2 Expertise of the EAP

CES is a specialist environmental consulting firm. Established in 1990, with offices in Grahamstown, East London, Port Elizabeth, Cape Town, Johannesburg, and Maputo, we primarily specialise in assessing the impacts of development on the natural, social and economic environments. CES' core expertise lies in the fields of strategic environmental assessment, environmental management plans, environmental management systems, ecological/environmental water requirements, environmental risk assessment, environmental auditing and monitoring, integrated coastal zone management, social impact assessment and state of environment reporting. In addition to adhering to all relevant national legislative requirements, which we are often required to review and summarise for specific projects, acquisition of equity funding from the majority of financial institutions demands that developments must meet certain minimum standards that are generally benchmarked against the Policy and Performance Standards of the International Finance Corporation and the World Bank Operational Directives and Policies.

3.1.3 Team Members and Specialists for the EIA

Provided below are short *curriculum vitae* (CVs) of each of the project team members involved in the conduct of the EIA and preparation of the EMPr for the proposed project. Table 3-1 provides the details of the specialists that provided input into this EMPr in accordance with their specialist studies undertaken as part of the EIA Phase.

Mr Marc Hardy, Coastal and Environmental Services (CES)

Marc is a Principal Consultant at CES. He holds a M.Phil in Environmental Management from Stellenbosch University's School of Public Management and Planning. His professional interests include environmental impact reporting for linear, energy and bulk infrastructure projects, strategic environmental policy development and reporting – mostly relating to Environmental Management Framework's (EMFs) - compliance monitoring and environmental auditing. Marc has, amongst others, been project manager for the Dinokeng EMF (Gauteng), the Milnerton Refinery to Ankerlig Power Station Liquid Fuels Transportation Infrastructure Project, numerous Eskom Transmission and Distribution power line and substation EIAs countrywide, mining EMPr compliance audits, compliance audits for Camden, Grootvlei and Komati Power Stations and the hazardous waste management facility for the Coega Development Corporation (Coega IDZ). Before entering the consulting field he gained extensive experience in the EIA regulatory field whilst in the employ of the Gauteng Department of Agriculture, Conservation and Environment - being responsible for the review of infrastructure projects like the Gautrain Rapid Rail system and representing the Department on various EMF project steering committees. He is currently managing numerous EIA processes for wind energy developments countrywide, as well as renewable energy and mining projects throughout Africa.

Mr Bill Rowston (*Role: Project Leader and Reviewer*)

Bill graduated from the University of Salford, England, with a first class honours degree in civil engineering in 1971, after which he worked for more than 36 years in the English and South African water sectors. He spent 24 years with the Department of Water Affairs and Forestry in South Africa where, as a hydraulics specialist, he contributed to the development of approaches for protecting water resources, including the determination of the ecological Reserve of South Africa’s National Water Act. Bill was closely involved with the development of the National Water Policy (1997) and the National Water Act (1998), and was responsible for compiling the National Water Resource Strategy, First Edition (2005), much of which he wrote. He also supervised the development of guidelines for the preparation of sub-national catchment management strategies. He joined CES in April 2007, where, in addition to managing a number of environmental impact assessments, he has co-authored a Technical Report on the determination and implementation of environmental water requirements for the Ramsar Convention on Wetlands and coordinated the determination of the riverine impacts of a proposed peaking hydroelectric power station in Zambia. He has contributed to the development of a new national water law for Vietnam, South Africa’s National Groundwater Strategy, and catchment management strategies in South Africa.

Mr Jadon Schmidt (*Project Manager and Report Production*)

Jadon is a Senior Environmental Consultant and holds a BSc degree in Geology and Botany, a BSc Honours degree in Botany (both from NMMU) and an MBA from Rhodes University with a core environmental management and sustainability focus. His MBA thesis addressed resource economic issues of marine protected areas. He is currently completing an MSc in estuarine ecology dealing specifically with sea level rise impacts on sediment and vegetation dynamics. Climate change, wetland ecology, renewable energy and resource economics are among his professional interests. Jadon is currently project manager / team member for a number of wind energy and industrial development projects in South Africa and Sierra Leone.

Ms Amber Jackson (*Report Production, Public Participation*)

Ms Amber Jackson, Environmental Consultant, has an MPhil in Environmental Management from the University of Cape Town. Topics covered included environmental management theory, social and ecological systems, climate change and environmental law. With a dissertation in food security that investigated the complex food system of soft vegetables produced in the Philippi Horticultural Area and the soft vegetables purchased at different links, both formal and informal, in the food system. Prior to this she obtained a BSc degree in Zoology and ‘Ecology, Conservation and Environment’ and a BSc (Hons) in ‘Ecology, Conservation and Environment from the University of the Witwatersrand. Her honours thesis title was: Landscape Effects on the Richness and Abundance of the Herpetofauna in the Kruger National Park.

Ms Leigh-Ann De Wet (*Ecological Specialist and Report Production*)

Environmental Consultant/Botanical Specialist. Leigh-Ann holds a BSc (Botany and Entomology) as well as a BSc (Hons) and MSc in Botany from Rhodes University. She conducts vegetation sensitivity assessments, to guide developments and thereby minimising their impacts sensitive vegetation.

Table 3-1: Specialists involved in the Proposed Plan 8 Grahamstown Wind Energy Project EIA Phase

Specialist Study	Affiliation	Name of Lead Specialist(s)
Noise	Safetech	Mr Brett Williams
Heritage	Nilssen Archaeological Resources Management	Mr Peter Nilssen
Avifauna (including long term monitoring)	Wildskies Ecological Services	Mr Jon Smallie
Visual	MapThis	Mr Henry Holland
Ecological	Coastal and Environmental Services	Prof. Roy Lubke
		Ms. Leigh-Ann De Wet
Bats (including long term monitoring)	Animalia Zoological and Ecological Consultation	Mr Werner Marais

Specialist Study	Affiliation	Name of Lead Specialist(s)
Palaeontological	Rob Gess Consulting	Dr Rob Gess
Agricultural	Isi-iXwiba Consulting	Mr Chris Bradfield
Socio-economic	Urban Econ	Mr Matthew Keely

3.1.4. Team Members and Specialists for the Amendment Application

Dr Alan Carter

Alan is the EAP for this amendment application. He has been a Director / Executive with CES for 17 years. He is registered with the South African Council for Natural Scientific Profession, the Environmental Assessment Practitioners Southern Africa and the Institute Waste Management Southern Africa. He is also a Public Accountant registered with the Texas State Board of Public Accountancy (USA). Alan's main areas of expertise are in marine ecology, environmental and coastal management, waste management, environmental management systems, auditing and due-diligence, and financial accounting and project feasibility studies. Alan oversees all CES's renewable energy assessment and studies.

Bill Rowlston

As described in section 3.1.3 above, but since January 2017, having retired from CES, Bill has functioned as a CES Associate. Bill has been responsible for coordinating all aspects of the amendment application, and has compiled all reports.

Table 3-2: Specialists involved in the Proposed Plan 8 Grahamstown Wind Energy Project EA Amendment Application Phase

Specialist Study	Affiliation	Name of Lead Specialist(s)
Noise	Safetech	Mr Brett Williams
Heritage	Nilssen Archaeological Resources Management	Mr Peter Nilssen
Avifauna (including long term monitoring)	Wildskies Ecological Services	Mr Jon Smallie
Visual	EOH Coastal & Environmental Services	Mr Michael Johnson (Note 1)
Ecological	EOH Coastal & Environmental Services	Mr Roy de Kock (note 2)
Bats (including long term monitoring)	Animalia Zoological and Ecological Consultation	Mr Werner Marais
Palaeontological	Rob Gess Consulting	Dr Rob Gess
Agricultural	Isi-iXwiba Consulting	Mr Chris Bradfield
Socio-economic	Urban Econ	Mr Matthew Keely

Notes:

- 1 At the time of preparing the Specialist Opinions for Amendment Report the original author had left the employment of CES, and the specialist opinion was written by R de Kock, who contributed to the preparation of the ecological components of the EIA Report, together with Ms de Wet and Professor Roy Lubke
- 2 At the commencement of this Amendment Application Mr Holland informed us that he had left the field of VIAs some time previously, and was not available to assess the implications of the proposed amendments. He also informed us that he was no longer in possession of any of the data and information he had used for the original assessment for the EIA. The report included in this Amendment Report – Visual Impact Assessment of the Proposed Amendments, August 2018 – was prepared by Coastal and Environmental Services (Mr Johnson).

3.2 Scope of the Plan 8 Grahamstown Wind Energy Project EMPr

The purpose of this EMPr is to ensure good environmental practice by taking a holistic approach to the management of environmental impacts during the construction and operation of the proposed Plan 8 Grahamstown Wind Energy Project. This EMPr therefore sets out the methods by which proper environmental controls are to be implemented by the applicant and his nominated contractor based largely on the mitigation measures recommended in the specialist reports and the

EIR. However, where necessary, these methods have been expanded and additional issues addressed in order to ensure that all environmental aspects are appropriately considered and monitored. The duration over which the contractor's controls shall be in place cover the construction period of the project as well as the limited time after contract completion defined by the General Conditions of Contract, and the project specifications, as the defects notification period. It is important to note that this EMPr will be focused primarily on the construction and operational phases of the proposed project. Design specifications from an environmental point of view were taken into consideration in the detailed EIR Phase during which, the Environmental Assessment Practitioner (EAP) and Specialist Consultants provided input with regards to possible mitigation measures to reduce environmental impacts.

The provisions of this EMPr are binding on the contractor during the construction period. They are to be read in conjunction with all the documents that comprise the suite of documents for this contract (refer to Section 3.3). In the event that any conflict occurs between the terms of this EMPr and the project specifications, or the conditions of the Environmental Authorisation, the terms herein shall be subordinate.

This EMPr has been designed to suite the particular activities and needs of the proposed Plan 8 Grahamstown Wind Energy Project, and incorporates the following:

- General construction mitigation measures;
- Specific project mitigation measures.

The EMPr therefore identifies the following:

- Construction activities that will impact on the environment;
- Operational activities that will impact on the environment;
- Specifications with which the contractor must comply in order to protect the environment from the identified impacts;
- Actions that must be taken in the event of non-compliance.

It is important to note that the EMPr is a dynamic document subject to similar influences and changes as are brought by variations to the provisions of the project specification. Any substantial changes must be submitted to the Contractor, Resident Engineer, Plan 8 (Pty) Limited and relevant environmental authorities in writing for approval. It must be emphasised that some changes may have budget and timeframe implications.

3.3 Applicable Documentation

The following environmental documentation is applicable to this project, and should be read in conjunction with this EMPr.

- *Proposed Plan 8 Grahamstown Wind Energy Project **Volume 1: Final Scoping Report*** (CES, January 2012).
- *Proposed Plan 8 Grahamstown Wind Energy Project **Volume 3: Environmental Impact Assessment Report*** (CES, February 2015)
- *Amendment of the Environmental Authorisation for the Plan 8 Grahamstown Wind Energy Facility, Eastern Cape Province, South Africa, EOH Coastal & Environmental Services, Grahamstown, **Amendment Report**, May 2019* (CES, May 2019).

The Environmental Authorisation issued by the Department of Environmental Affairs (DEA 2015) for the original approved project. Where necessary this Revised EMPr has been amended to comply with the requirements of the Environmental Authorisation.

Any conditions in an Environmental Authorisation that may be issued for the proposed amended project must be included in the Revised EMPr, which must be and submitted to DEA for approval.

Other documentation which should be considered includes:-

- All applicable contract documentation.
- Details of all applicable environmental legislation, including subsidiary legislation such as regulations.

3.4 Definitions applicable to the environmental aspects of the project

The definitions in this document are for explanatory purposes only. In the event that any conflict occurs between these definitions and those contained within the final Contract, those within the Contract will prevail.

Alien Vegetation: Alien vegetation is defined as undesirable plant growth that includes, but is not limited to, all declared category 1 and 2 listed invader species as set out in the Conservation of Agricultural Resources Act (CARA) Regulations. Other vegetation deemed to be alien shall be those plant species that show the potential to occupy in number, any area within the defined construction area and which are declared to be undesirable.

Construction Camp: Construction camps (site camps) refer to all storage and stockpile sites, site offices, container sites, workshops and testing facilities, and other areas required to support or provision construction activities.

Environmental Site Officer (ESO): An ESO is the site-based designated person responsible for implementing the environmental provisions of the Construction Contract and is appointed by the service provider that carries out construction activities. The ESO will be the designated responsible person for implementing any remedial measures as required from time to time and for any authorisations/licences that are required in terms of the service contract. The ESO must record and communicate environmental issues (as they occur) to the Contractor and maintain records thereof. The ESO must report concurrently to the contractor and the ECO.

Environmental Control Officer (ECO): A suitably qualified and experienced person or entity appointed for the Construction Works, to perform the obligations specified in the environmental authorisation. The ECO's duties will include *inter alia*:

- Confirming that all required environmental authorisations and permits, where necessary, have been obtained from the relevant authority(ies);
- Monitoring all activities relating to the project, on a daily basis (or as agreed), for compliance with the provisions of the environmental authorisation, environmental legislation and recommendations of the EMPr;
- Conducting annual environmental performance audits in respect of the activities undertaken relating to the project

Environment: Environment means the surroundings within which humans exist and that could be made up of:-

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

Environmental Aspect: An environmental aspect is any component of a contractor's construction activity that is likely to interact with the environment.

Environmental Authorisation: A written statement from the competent (environmental) authority, with or without conditions, that records its approval of a planned undertaking and the mitigating measures required to prevent or reduce the effects of environmental impacts during the life of the project.

Environmental Impact: An impact or environmental impact is the change to the environment,

whether desirable or undesirable, that will result from the effect of an activity.

Environmental Impact Assessment: The process of examining the environmental effects of a proposed development. The assessment requires detailed/specialist studies of significant issues that have been identified during the environmental scoping.

Environmental Management Programme: An environmental management tool used to ensure that undue or reasonably avoidable adverse impacts of the construction, operation and decommissioning of a project are prevented; and that the positive benefits of the projects are enhanced.

Environmental Management System: The internationally accepted and recognized environmental management system (EMS) which enables companies, organizations and operations to systematically manage, prevent and reduce environmental problems and associated costs. In terms of ISO 14001 an EMS is defined as, “*that part of the overall management system includes organizational structure, planning activities, responsibilities, procedures, processes and resources for developing, implementing, reviewing and maintaining the environmental policy.*”

Environmental Policy: A statement by the organisation of its intentions and principles in relation to its overall environmental performance which provides a framework for action and for the setting of its environmental objectives and targets.

External Auditor: A suitably qualified and experienced independent expert in accordance with the required qualifications for an auditor (ISO 14012).

Independent Environmental Consultant: A suitably qualified and experienced independent environmental consultant (IEC) appointed by the Engineer to perform the obligations specified in the Contract. The IEC must provide reports to the regulatory authority, the Engineer and any other parties as specified by the regulatory authority.

Interested and Affected Party: Refers to an interested and affected party contemplated in section 24(4)(d) of the National Environmental Management Act, 1998 (Act No. 107 of 1998) and which in terms of that section includes –

- a) *Any person, groups of persons, organisation interested in or affected by an activity, and;*
- b) *Any organ of state that may have jurisdiction over any aspect of the activity.*

ISO 14001 Environmental Management System (ISO 14001): The internationally accepted and recognised Environmental Management System as reflected in the document SABS ISO 14001: 1996.

Method Statement: A written submission by the Contractor in response to the Specification or a request by the Engineer, setting out the plant, materials, labour and methods the Contractor proposes using to carry out an activity, identified by the relevant specification or the IEC when requesting the Method Statement, in such detail that the IEC is enabled to assess whether the Contractor’s proposal is in accordance with the EMP and associated specifications.

Mitigate: The implementation of practical measures to reduce the adverse impacts, or to enhance beneficial impacts of a particular action.

No-Go Area: Areas in which construction activities are prohibited.

Pollution: According to the National Environmental Management Act, No. 107 of 1998, pollution can be defined as, “*Any change in the environment caused by (i) substances; (ii) radioactive or other waves; or (iii) noise, odours, dust or heat emitted from any activity, including the storage or treatment of waste or substances, construction and the provision of services, whether engaged in by any person or an organ of state, where that change has an adverse effect on human health or well-being or on the composition, resilience and productivity of natural or managed ecosystems, or*

on materials useful to people, or will have such an effect in the future”

Rehabilitation: To re-establish or restore to a healthy, sustainable capacity or state.

Site: The area in which construction is taking place.

Species of Special Concern: Those species listed in the *Rare*, *Indeterminate*, or *Monitoring* categories of the South African Red Data Books, and/or species listed in Globally Near Threatened, Nationally Threatened or Nationally Near Threatened categories (Barnes, 1998).

Threatened species: Threatened species are defined as: a) species listed in the Endangered or Vulnerable categories in the revised South African Red Data Books or listed in the Globally Threatened category; b) species of special conservation concern (i.e. taxa described since the relevant South African Red Data Books, or whose conservation status has been highlighted subsequent to 1984); c) species which are included in other international lists; or d) species included in Appendix 1 or 2 of the Convention of International Trade in Endangered Species (CITES).

Topsoil: The top 100-150mm of the soil profile, and may include organic top material such as vegetation and leaf litter.

4 ENVIRONMENTAL POLICY

4.1 Environmental Policies and Guidelines

4.1.1 Environmental Policy

The Contractor is required to compile an environmental management policy, which must consider the following:

- The Contractor's mission, vision and core values;
- Guiding principles;
- Requirements of, and communication with interested and affected parties (I&APs);
- The need to work towards continual improvement;
- The obligation to prevent pollution and ecological degradation;
- The importance of coordination with other organisational policies (such as quality, occupational health and safety);
- Reference to specific local and/or regional conditions; and
- A commitment to comply with relevant environmental laws, regulations, by-laws and other criteria to which the Contractor subscribes.

The policy, once approved by Plan 8, must be communicated to all employees and sub-contractors of the Contractor, and made available to the public, if requested.

4.1.2 Environmental Objectives and Targets

In order to meet the commitments detailed in the environmental policy, as well as those included in the environmental specifications of this EMPr, the Contractor must develop environmental objectives and targets. The objectives and targets must conform to, and comply with, the following criteria:

- The objectives and targets must constitute the overall goals for environmental performance identified in the environmental policy and strategy.
- When establishing objectives and targets the Contractor must take into account the identified environmental aspects and associated environmental impacts, as well as the relevant findings from environmental reviews and/audits.
- The targets must be set to achieve objectives within a specified timeframe.
- Targets should be specific and measurable.
- When the objectives and targets have been set the Contractor must establish measurable Key Performance Indicators (KPIs). These will be used by the Contractor as the basis for an environmental performance evaluation system, and can provide information on both the environmental management and the operational systems. Objectives and targets must apply broadly across the Contractor's operations, as well as to site-specific and individual activities.
- Objectives and targets must be reviewed from time to time in light of changed operational circumstances and/or changes in environmental legal requirements, and must also take into consideration the views of interested and affected parties (I&APs).

All objectives and targets must be supplied to the Independent Environmental Consultant or ECO for review and use during audits, as will be prescribed in the conditions of the Environmental Authorisation.

4.2 Legislative Framework

Construction must be according to the best industry practices, as identified in the project documents. This EMPr, which forms an integral part of the contract documents, informs the contractor as to his duties in the fulfilment of the project objectives, with particular reference to the prevention and mitigation of environmental impacts caused by construction activities associated with the project. The Contractor should note that obligations imposed by the approved EMPr are legally binding in terms of environmental legislation and in terms of the additional conditions attached to the general conditions of contract that relate to this project. In the event that any rights

and obligations contained in this document contradict those specified in the standard or project specifications then the latter will prevail.

4.2.1. Statutory and Other Applicable Legislation and Standards

The Contractor must identify and comply with all South African national and provincial environmental legislation, including associated regulations and all local by-laws relevant to the project. Key legislation currently applicable to the design, construction and implementation phases of the project must be complied with. The list of applicable legislation provided below is intended to serve as a guideline only and is not exhaustive:-

- The Constitution of the Republic of South Africa Act 108 of 1996
- Environment Conservation Act 73 of 1989
- National Environmental Management Act 107 of 1998, as amended
- National Environmental Management: Protected Areas Act 57 of 2003
- National Environmental Management: Biodiversity Act 10 of 2004
- National Forests Act 43 of 1983
- National Water Act 36 of 1998
- Conservation of Agricultural Resources Act 43 of 1983
- National Veld and Forest Fire Act 101 of 1998
- Hazardous Substances Act 15 of 1973
- National Heritage Resources Act 25 of 1999
- Atmospheric Pollution Prevention Act 45 of 1965
- National Environmental Management: Air Quality Act 39 of 2004
- National Environmental Management: Waste Management Act 59 of 2008
- Mineral and Petroleum Resources Development Act 28 of 2002
- Health Act 63 of 1977
- Occupational Health and Safety Act 85 of 1993
- White Paper on the Conservation and Sustainable Use of South Africa's Biological Diversity
- All relevant provincial legislation and ordinances, and municipal by-laws.

The following permit requirements would be relevant to the proposed project:

- Permit for the removal of protected plants on the site (DAFF);
- Approval from the South African Heritage Resources Agency (SAHRA) on cultural issues;
- Fuel storage permit (temporary and permanent) obtained from DEA;
- Blasting permit – obtained from the Department of Mineral Resources (DMR), if required.

The Contractor must establish and maintain procedures to keep track of, document and ensure compliance with, environmental legislative changes.

4.2.2. IFC performance standards and Equator principles

All applicable national or international best practice environmental standards will be adhered to. Plan 8 (Pty) Limited intend to secure project financing from funding institutions that adhere to the Equator Principles, as well as the requirements as set out by the International Finance Corporation (IFC) Performance Standards. The Equator Principles are a financial industry benchmark for determining, assessing and managing social and environmental risks to projects. There is close alignment between the Equator Principles and the IFC Performance Standards and Sector Guidelines.

5 ADMINISTRATION AND REGULATION OF ENVIRONMENTAL OBLIGATIONS

5.1 Management Structure

In line with this EMPr the Contractor must prepare a document clearly outlining and demonstrating the environmental responsibilities, accountability and liability of the Contractor's employees. The Contractor should assign responsibilities for the following:

- Reporting structures.
- Actions to be taken to ensure compliance.
- Overall design, development and implementation of the EMPr.
- Documenting the environmental policy and strategy.
- Implementing the EMPr in all stages/phases of the project.
- All the aspects which require action under the other core elements and sub-elements of the EMPr.

All official communication and reporting lines including instructions, directives and information must be channelled according to the organisation structure.

5.2 Roles and Responsibilities

5.2.1 Plan 8 (Pty) Ltd

Plan 8 is the applicant and will therefore be the entity monitoring the implementation of the EMPr and compliance with the authorisation. However, if Plan 8(Pty) Ltd appoints a Contractor to implement the project, and hence implement the proposed mitigation measures documented in this EMPr on their behalf, then the successful contractor's responsibilities are outlined in Section 5.2.2 that follows.

5.2.2 Contractor

The successful Contractor must:

- Be responsible for the finalisation of the EMPr in terms of methodologies which are required to be implemented to achieve the environmental specifications contained herein and the relevant requirements contained in the environmental authorisation, if issued by DEA;
- Be responsible for the overall implementation of the EMPr in accordance with the requirements of Plan 8 and the environmental authorisation, if issued by DEA;
- Ensure that all third parties who carry out all or part of the Contractor's obligations under the Contract comply with the requirements of this EMPr;
- Sign the Pro-Forma: Protection of the Environment (attached as Annexure A).
- Be responsible for obtaining any environmental permits (refer to Section 4.2.1) which are required for the design, construction and operation of the Plan 8 Grahamstown Wind Energy Project.
- Ensure that the appointments of the ECO and ESO are subject to the approval of Plan 8.

5.2.3 Environmental Site Officer

The Contractor must appoint a nominated representative of the contractor as the Environmental Site Officer (ESO) for the contract.

The ESO will be site-based and will be the responsible person for implementing the environmental provisions of the construction contract.

There must be an approved ESO on the site at all times. It may be necessary to have more than one ESO. The ESO's duties will include, *inter alia*, the following:

- Ensuring that all the environmental authorisations and permits required in terms of the applicable legislation have been obtained prior to construction commencing.

- Reviewing and approving construction method statements with input from the ECO and Engineer, where necessary, in order to ensure that the environmental specifications contained within the construction contract are adhered to.
- Assisting the Contractor in finding environmentally responsible solutions to problems.
- Keeping accurate and detailed records of all activities on site.
- Keeping a register of complaints on site and recording community comments and issues, and the actions taken in response to these complaints.
- Ensuring that the required actions are undertaken to mitigate the impacts resulting from non-compliance.
- Reporting all incidences of non-compliance to the ECO and Contractor.

The ESO must submit regular written reports to the ECO, but not less frequently than once a month.

The ESO must have:

- The ability to manage public communication and complaints;
- The ability to think holistically about the structure, functioning and performance of environmental systems;
- The ESO must be fully conversant with the Environmental Impact Assessment Report and Environmental Management Programme for the Plan 8 Grahamstown Wind Energy Project, and all relevant environmental legislation;
- The ESO must have received professional training, including training in the skills necessary to be able to amicably and diplomatically deal with the public as outlined in the first bullet point above.

5.2.4. Environmental Control Officer

For the purposes of implementing the conditions contained herein, Plan 8 shall appoint an Environmental Control Officer (ECO) for the contract. The ECO shall be the responsible person for ensuring that the provisions of the EMPr as well as the environmental authorisation are complied with during the construction period. The ECO will be responsible for issuing instructions to the contractor and where environmental considerations call for action to be taken. The ECO shall submit regular written reports to Plan 8, but not less frequently than once a month.

The ECO will be responsible for the monitoring, reviewing and verifying of compliance with the EMPr and conditions of the environmental authorisation by the Contractor. The ECO's duties in this regard will include, *inter alia*, the following:

- Confirming that all the environmental authorisations and permits required in terms of the applicable legislation have been obtained prior to construction commencing.
- Monitoring and verifying that the EMPr, Environmental Authorisation and Contract are adhered to at all times and taking action if specifications are not followed.
- Monitoring and verifying that environmental impacts are kept to a minimum.
- Reviewing and approving construction method statements with input from the ESO and Engineer, where necessary, in order to ensure that the environmental specifications contained within this EMPr and environmental authorisation are adhered to.
- Inspecting the site and surrounding areas on a regular basis regarding compliance with the EMPr, Environmental Authorisation and Contract.
- Monitoring the undertaking by the Contractor of environmental awareness training for all new personnel on site.
- Ensuring that activities on site comply with all relevant environmental legislation.
- Ordering the removal of, or issuing spot fines for person/s and/or equipment not complying with the specifications of the EMPr and/or environmental authorisation.
- Undertaking a continual internal review of the EMPr and submitting any changes to Plan 8 and/or DEA (in case of major changes) for review and approval.
- Checking the register of complaints kept on site and maintained by the ESO and ensuring that the correct actions are/were taken in response to these complaints.

- Checking that the required actions are/were undertaken to mitigate the impacts resulting from non-compliance.
- Reporting all incidences of non-compliance to Plan 8.
- Conducting annual environmental performance audits in respect of the activities undertaken relating to the project. The ECO shall also submit compliance audit reports to DEA, in accordance with the requirements of the environmental authorisation. Such reports shall be reviewed by Plan 8, prior to submission.
- Keeping a photographic record of progress on site from an environmental perspective. This can be conducted in conjunction with the ESO as the ESO will be the person that will be onsite at all times and can therefore take photographic records weekly. The ECO will need to check and ensure that the ESO understands the task at hand.
- Recommending additional environmental protection measures, should this be necessary.
- Providing report back on any environmental issues at site meetings.

The ECO must have:

- A good working knowledge of all relevant environmental policies, legislation, guidelines and standards;
- The ability to conduct inspections and audits and to produce thorough, readable and informative reports;
- The ability to manage public communication and complaints;
- The ability to think holistically about the structure, functioning and performance of environmental systems; and
- Proven competence in the application of the following integrated environmental management tools:
 - Environmental Impact Assessment.
 - Environmental management plans/programmes.
 - Environmental auditing.
 - Mitigation and optimisation of impacts.
 - Monitoring and evaluation of impacts.
 - Environmental Management Systems.

The ECO must be fully conversant with the Environmental Impact Assessment Report and EMPr, Environmental Authorisation for the Plan 8 Grahamstown Wind Energy Project, and all relevant environmental legislation.

The ECO must be in a position to determine whether or not the ESO has adequately demonstrated his/her capabilities to carry out the tasks at hand in a professional manner. The ECO will therefore have the authority to instruct the contractor to replace the ESO if, in the ECO's opinion, the appointed officer is not fulfilling his/her duties in terms of the requirements of the construction contract. Such instruction must be in writing and must clearly set out the reasons why a replacement is required and within what timeframe. The ECO must visit the site and, in addition to the responsibilities listed in section 5.2.4 below, review the performance of the ESO and submit regular performance reviews to Plan 8, but not less frequently than once a month.

Plan 8 has the authority to replace the ECO if, in their opinion, the appointed officer is not fulfilling his/her duties in terms of the requirements of the EMPr or this specification. Such instruction will be in writing and shall clearly set out the reasons why a replacement is required and within what timeframe.

5.2.5. Traffic Safety Officer

The Contractor must nominate knowledgeable members of staff on site, who will be the responsible persons for the arrangement and maintenance of all traffic accommodation measures required for the duration of the contract. The Traffic Safety Officer must liaise with the ESO and/or ECO in order to ensure adequate and appropriate traffic arrangements during the transportation of turbine components to the site.

5.2.6. Independent External Environmental Auditor

An independent external environmental auditor must be appointed by Plan 8 to ensure compliance with the EMPr. The intervals at which environmental audits should be undertaken must be agreed upon by Plan 8, the Contractor, the Engineer, DEA and the external auditor. The environmental audit programme must at least include the following:

- A comprehensive environmental audit to be undertaken at the end of the design phase to verify compliance with the EMPr, Environmental Authorisation, Contract, and all applicable environmental legislation.
- Comprehensive environmental audits to be undertaken periodically (at least every two months) during the construction phase, to verify compliance with the EMPr, Environmental Authorisation, Contract Specifications, and all applicable environmental legislation. An audit report must contain recommendations on environmental management activities which are required to be implemented. The external auditor must report concurrently to the Contractor and Plan 8.
- A comprehensive environmental audit must be undertaken at the completion of the construction phase for various sections of the wind energy facility, to verify compliance with the EMPr and all applicable environmental legislation. An audit report must contain recommendations on environmental management activities which are required to be implemented within the operation and maintenance phases. The external auditor must report concurrently to the Contractor and Plan 8.
- Periodic environmental audits must be undertaken during the operation and maintenance phases in order to verify on-going satisfactory environmental management performance. These audits must be followed up with appropriate remedial and corrective actions should the audit findings demonstrate any non-conformance or non-compliance with the specifications of the EMPr.
- Compile and agree on (together with Plan 8 Pty Ltd) a template for the ECO and ESO monthly reports: this means that an independent auditor must be appointed at the commencement of the project, before construction begins.

5.2.7. Liaison Committee

A liaison committee consisting of representatives from Plan 8, the Contractor, the Engineer, DEA and any other role-player deemed necessary by the members of the committee (the “Liaison Committee”) will meet every month to review the progress of the Contract in implementing and complying with its obligations in terms of this EMPr.

5.3 Reporting

5.3.1. Administration

Before the contractor begins each construction activity, the Contractor must give to the ECO and engineer a written method statement setting out the following:

- The type of construction activity.
- Locality where the activity will take place.
- Identification of impacts that might result from the activity.
- Identification of activities or aspects that may cause an impact.
- Methodology and/or specifications for impact prevention for each activity or aspect.
- Methodology and/or specifications for impact containment for each activity or aspect.
- Emergency/disaster incident and reaction procedures.
- Treatment and continued maintenance of impacted environment.

The contractor may provide such information in advance of any or all construction activities provided that new submissions shall be given to the ECO and/or engineer whenever there is a change or variation to the original.

The ECO and/or engineer may provide comment on the methodology and procedures proposed by

the Contractor but he shall not be responsible for the contractor's chosen measures of impact mitigation and emergency/disaster management systems. However, the contractor must demonstrate, at inception and at least once during the contract, that the approved measures and procedures function properly.

5.3.2. Good Housekeeping

The contractor must undertake "good housekeeping" practices during construction. This will help avoid disputes on responsibility and allow for the smooth running of the contract as a whole. Good housekeeping extends beyond the wise practice of construction methods that leaves production in a safe state from the ravages of weather to include the care for and preservation of the environment within which the site is situated.

5.3.3. Record Keeping

The engineer and the ECO must continuously monitor the contractor's adherence to the approved impact prevention procedures and the engineer must issue to the contractor a notice of non-compliance whenever transgressions are observed. The ECO must document the nature and magnitude of the non-compliance in a designated register, the action taken to discontinue the non-compliance, the action taken to mitigate its effects and the results of the actions. The non-compliance must be documented and reported to the engineer in the monthly report. These reports must be made available to DEA when requested.

The Contractor must ensure that an electronic filing system identifying all documentation related to the EMP is established. A list of reports likely to be generated during all phases of the Plan 8 Grahamstown Wind Energy Project is provided below, and all applicable documentation must be included in the environmental filing system catalogue or document retrieval index (the list is not exhaustive):

- Final Environmental Impact Assessment Report.
- Environmental Management Programme.
- Final design documents and diagrams issued to and by the Contractor.
- All communications detailing changes of design/scope that may have environmental implications.
- Daily, weekly and monthly site monitoring reports.
- Complaints register.
- Medical reports.
- Training manual.
- Training attendance registers.
- Incident and accident reports.
- Emergency preparedness and response plans.
- Copies of all relevant environmental legislation.
- Permits and legal documents, including letters authorising specific personnel of their duties as part of emergency preparedness teams e.g. fire teams, etc.
- Crisis communication manual.
- Disciplinary procedures.
- Monthly site meeting minutes during construction.
- All relevant permits.
- Environmental Authorisation on the EIA from the DEA.
- All method statements from the Contractor for all phases of the project.

5.3.4. Document Control

The Contractor and resident engineer will be responsible for establishing a procedure for electronic document control. The document control procedure must comply with the following requirements:

- Documents must be identifiable by organisation, division, function, activity and contact person.
- Every document must identify the personnel and their positions, who drafted and compiled the

document, who reviewed and recommended approval, and who finally approved the document for distribution.

- All documents must be dated, provided with a revision number and reference number, filed systematically, and retained for a five-year period.

The Contractor must ensure that documents are periodically reviewed and revised, where necessary, and that current versions are available at all locations where operations essential to the functioning of the EMP are performed. All documents must be made available to the independent external auditor.

5.4 Environment and Health Training and Awareness

The ESO and/or ECO must be conversant with all legislation relating to the environment that are applicable to this contract, and must be appropriately trained in environmental management and must possess the skills necessary to impart environmental management skills to all personnel involved in the contract.

The contractor must ensure that adequate environmental training takes place. All employees must have been given an induction presentation on environmental awareness. Where possible, the presentation should be conducted in the language of the employees. The environmental training must, as a minimum, include the following:

- The importance of complying with all environmental policies.
- The significant environmental impacts, actual or potential, as a result of their work activities.
- The environmental benefits of improved personal performance.
- Their roles and responsibilities in achieving compliance with the environmental policy and procedures, and with the requirement of Plan 8's environmental management systems, including emergency preparedness and response requirements.
- The potential consequences of departure from specified operating procedures.
- The mitigation measures required to be implemented when carrying out their work activities.
- The importance of not littering.
- The need to use water sparingly.
- Details of, and encouragement to, minimise the production of waste and re-use, recover and recycle waste where possible.
- Details regarding archaeological and/or historical sites which may be unearthed during construction and the procedures to be followed should these be encountered.
- The procedures to be followed should a grave be encountered, or unearthed during the construction phase.
- Details regarding fauna and flora of special concern, including protected/endangered plant and animal species, and the procedures to be followed should these be encountered during the construction phase.

In the case of permanent staff the contractor must provide evidence that such induction courses have been presented. In the case of new staff (including contract labour) the contractor must inform the engineer when and how he intends concluding his environmental training obligations.

A training needs analysis must be conducted by the ESO and/or ECO to identify the appropriate environmental and health training programmes, and the appropriate target groups amongst the employees of the Contractor. The results of the environment and health training needs analysis must be filed with the environmental records and used to set objectives and targets. Recommended Basic Environmental Education Material is provided in Annexure B.

Environment and health awareness training programmes should be targeted at three distinct levels of employment: that is, members of the executive, middle management and labour. Environmental awareness training programmes should contain the following information:

- The names, positions and responsibilities of personnel to be trained.

- The framework for appropriate training plans.
- The summarised content of each training course.
- A schedule for the presentation of the training courses.

The Contractor must ensure that records of all training interventions are kept in accordance with the record keeping and documentation control requirements as set out in this EMPr (refer to Sections 5.3.3 and 5.3.4 above). The training records must verify each of the targeted personnel's training experience. The ECO must monitor the records and listed and undertake regular follow ups.

5.5 Emergency Preparedness

The Contractor must compile and maintain environmental emergency procedures to ensure that there will be an appropriate response to unexpected or accidental actions or incidents that will cause environmental impacts, throughout the life cycle of the project. Such activities may include, *inter alia*:

- Accidental discharges to water and land.
- Accidental exposure of employees to hazardous substances.
- Accidental veld or forest fires.
- Accidental spillage of hazardous substances.
- Specific environmental and ecosystem effects from accidental releases or incidents.

These plans must include:

- Emergency organisation (manpower) and responsibilities, accountability and liability.
- A list of key personnel.
- Details of emergency services applicable to the various areas along the route that turbine components will be transported and for the site itself (such as the fire department, spill clean-up services).
- Internal and external communication plans, including prescribed reporting procedures where required by legislation.
- Actions to be taken in the event of different types of emergencies.
- Incident recording, progress reporting and remediation measures required to be implemented.
- Information on hazardous materials, including the potential impact associated with each, and measures to be taken in the event of accidental release.
- Training plans, testing exercises and schedules for effectiveness.

The Contractor must comply with the emergency preparedness and incident and accident-reporting requirements, as required by the Occupational Health and Safety Act, 1993 (Act No 85 of 1993), the National Environmental Management Act, 1998 (Act No 107 of 1998), the National Water Act, 1998 (Act No 36 of 1998) and the National Veld and Forest Fire Act, 1998 (Act No 101 of 1998) as amended and/or any other relevant legislation.

5.6 Checking and Corrective Action

5.6.1. Performance Indicators and Targets

Performance indicators and targets for compliance with the specifications of the EMPr must be agreed upon by Plan 8, the Engineer and the Contractor, and included in the final EMPr. Consideration should be given to the implementation of incentive bonuses for employees who look after the environment.

5.6.2. Non-Compliance

Non-compliance with the specifications of the EMPr and/or conditions of the Environmental Authorisation, both of which will be present on-site at all times, constitutes a breach of Contract for which the Contractor may be liable to pay penalties (see Annexure A). The Contractor is deemed not to have complied with the EMPr if:

- There is evidence of contravention of the EMPr specifications within the boundaries of the construction site, site extensions and haul/access roads;
- There is contravention of the EMPr specifications that relate to activities outside the boundaries of the construction site;
- Environmental damage ensues due to negligence;
- Construction activities take place outside the defined boundaries of the site; and/or
- The Contractor fails to comply with corrective or other instructions issued by the Engineer and/or ECO within a specific time period.

The contractor must act immediately when a notice of non-compliance is received and correct whatever was the cause for the issuing of the notice. Any non-compliance with the agreed procedures of the EMPr is a transgression of the various statutes and laws that define the manner by which the environment is managed, and therefore any avoidable non-compliance, depending on its severity, must be reported to Plan 8 for further action, prior to contacting the relevant provincial or national authorities. The engineer's decision with regard to what is considered a violation, its seriousness and the action to be taken against the contractor will be final. Failure to redress the cause must be reported to the relevant authority. The responsible provincial or national authorities must ensure compliance and impose penalties relevant to the transgression as allowed for within its statutory powers.

5.6.3. Monitoring

A monitoring programme must be implemented for the duration of the construction phase of the project. This programme must include:

- Performance Audits: Performance-based monthly inspection reports must be compiled by the ECO. This must incorporate monitoring of compliance issues as well as permits, licences, the EMPr, Environmental Authorisation, and all conditions in contract documentation. These audits can be conducted randomly and do not require prior arrangement with the project manager.
- Compliance Audits: The independent external auditor must undertake compliance audits every two months. Compilation of an audit report must include a rating of the compliance with the EMPr and the environmental authorisation. This report must be submitted to the relevant authorities as and when required.

It is important to note that the Environmental Authorisation will also specify the duties of the ECO and the frequency of reporting to DEA.

The following will also assist with monitoring:-

Complaints Register

The Contractor must ensure that a dedicated Complaints Register is kept on site at all times (see Annexure C). The register will contain the details of the person who made the complaint, the nature of the complaint received, the date on which the complaint was made and the response noted with the date and action taken. The Complaints Register must be kept in accordance with the requirements of the ECO. This record must be submitted with the monthly reports and an oral report must be given at the monthly site meetings.

Inspections

Ongoing visual inspections must be conducted daily by the ESO. The ESO must spend the bulk of his/her time on site in order to identify any unsafe acts and activities that transgress the requirements specified in the EMPr. The ESO compiles the site register and the ECO maintains the complaints register and any other records required in the Environmental Authorisation (the ESO will also have input into this, as he/she will be site-based).

Spot Fines

The ECO will be authorised to impose spot fines for any of the transgressions detailed below:

- Littering on site.

- Lighting of illegal fires on site.
- Any persons, vehicles or equipment related to the Contractor's operations found within the designated "no-go" areas.
- Excess dust or excess noise emanating from site.
- Possession or use of intoxicating substances on site.
- Any vehicles being driven over designated speed limits.
- Unauthorised removal and/or damage to fauna, flora or cultural or heritage objects on site.
- Urination and defecation anywhere on the site other than in the toilet facilities that have been provided.

These activities, along with the appropriate guidelines to determining the fines, must be agreed to by Plan 8, the engineer and the Contractor. Such fines will be issued in addition to any remedial costs incurred as a result of non-compliance with the Environmental Specifications and or legal obligations. Plan 8 will inform the Contractor of the contravention and the amount of the fine.

Penalty Fines

Where environmental damage is caused or a pollution incident, and/or failure to comply with any of the environmental specifications contained in the EMPr, the Contractor shall be liable to pay a penalty fine. The ECO must recommend to the Contractor the issuing of penalties for contravention of the EMPr, Environmental Authorisation, Contract, or environmental legislation. The following transgressions will be penalised:

- Hazardous chemical/oil spill.
- Damage to sensitive environments.
- Damage to cultural and historical sites.
- Unauthorised removal/damage to indigenous trees and other vegetation, particularly in identified sensitive areas.
- Uncontrolled/unmanaged erosion.
- Unauthorised blasting activities.
- Violation of environmental authorisation conditions.

These activities, along with the appropriate guidelines to determining fines, must be agreed to by Plan 8, the Engineer and the Contractor, and will be included within the final EMPr. In addition to penalties the Engineer has the power to remove from site any person who is in contravention of the EMPr, and if necessary the Engineer can suspend part of or all of the works, as required.

Internal Audits

Where the monitoring data and the inspections highlight any problems, an internal audit will be initiated by the ECO. The purpose of the audit is to ascertain the source of the problem and to define what action shall be taken to rectify the problem and prevent its reoccurrence.

External Audits

External audits will be conducted by an independent external auditor appointed by Plan 8. The external auditor will conduct an in-depth audit so as to ascertain compliance with the EMPr as well as the conditions of the environmental authorisation.

Incident Reporting and Remedy

If a leakage or spillage of hazardous substances occurs on site, the local emergency services must be immediately – within 24 hours at most - notified of the incident. The following information must be provided:

- The location;
- The nature of the load; and
- The status at the site of the accident itself (that is, whether further leakage is still taking place, whether the vehicle or the load is on fire).

Written records must be kept on the corrective and remedial measures decided upon and the progress achieved therewith over time. Such progress reporting is important for monitoring and auditing purposes. The written reports may be used for training purposes in an effort to prevent similar future occurrences. Annexure D provides an example of an environmental incidents

register.

Verbal instructions

Verbal instructions are likely to be the most frequently used form of corrective action and are given in response to transgressions that are evident during routine site inspections by the ESO and/or ECO. Verbal instructions are also used to create further awareness among employees, because often transgressions are a function of ignorance rather than carelessness or vindictiveness. Workers must obey verbal instructions through formally recording the actions taken to resolve the matter so that the instruction can be successfully finalised and recorded.

Maximum allowable response time: two working days.

Written instructions

Written instructions will be given following an audit. The written instructions must indicate the source or sources of the problems identified on site and propose solutions to those problems. The implementation of solutions must be assessed in a follow-up audit and further written instructions issued if required.

Maximum allowable response time: four working days.

Public Communication and Liaison with Interested and Affected Parties

The Contractor must comply with the requirements for public consultation as set out in the Constitution Act, 1996 (Act No 108 of 1996) and the National Environmental Management Act, 1998 (Act No 107 of 1998).

During the construction phase of the project, the Contractor will be responsible for erecting information boards, in the position, number, design and dimensions approved by the Engineer. The information boards must contain relevant information regarding the construction activity and the relevant contact details to assist persons who wish to submit complaints regarding construction activities.

Information distribution

Copies of the EMPr must be made available to I&APs on the Plan 8 website, at some of the local libraries, and on the CES website during the EIA process. Copies will also be distributed to all senior contract personnel. All senior personnel on the construction site will be required to familiarize themselves with the contents of the document.

5.7 Management Review

A formal management review must be conducted on a regular basis, in which the internal audit reports written by the ECO and based on frequent inspections and interactions with the ESO based on the latter's daily reports, audit reports by the independent external auditor will be reviewed. The purpose of the review is to critically examine the effectiveness of the EMPr and its implementation and to decide on potential modifications to the EMPr as and when necessary. The process of management review is in keeping with the principle of continual improvement. Management review will take place when the Liaison Committee (refer to Section 5.2.7. above) holds its monthly meeting to review the progress of the Contract in implementing and complying with its obligations in terms of this EMPr for the duration of the project. Where necessary, management review will take place more frequently than two months.

6 POTENTIAL ENVIRONMENTAL IMPACTS

Tables 6-1a to 6-1d below provide a summary of the potential environmental impacts identified during the studies conducted for the EIA, and assessment of their significance, with and without mitigation, that may occur during the construction and operational phases of the proposed Plan 8 Grahamstown Wind Energy Project.

It is important to note that no additional impacts were identified by the specialists who reviewed the results of the EIA studies for the EA amendment application. However, Table 6-1d presents a summary of the key results of the socio-economic impact assessment, which was updated for the EA amendment application to account for any changes that may have occurred since the EA study was conducted in 2013.

Chapter 7 provides the general and specific environmental specifications that must be implemented in order to mitigate negative environmental impacts and enhance positive impacts achieve the above-mentioned objectives. It is also advisable that the reader refers to the EIA Report and the specialist volume for this project in order to obtain a more detailed account of the potential environmental impacts associated with the proposed project, irrespective of their ranking, as these will need to be considered, and the mitigation and management measures associated with these impacts implemented.

Some comments have been added in Chapter 7 relating to the environmental specifications in respect of birds and bats (section 7.4.1 – markings on rotor blades, and SABAA recommendations for the siting of turbines), fossil finds (section 7.14.2), and socio-economics (section 7.26). These additional comments reflect more recent information since the EIA was conducted (birds and bats), existing measures emphasised by the specialists (palaeontology – fossil finds), and updated socio-economic information and data. These issues have been carried forward to Table 7.1., which tabulates all mitigation measures.

Table 6-1a: Summary of the impacts associated with the proposed Plan 8 Grahamstown Wind Energy Project during the construction phase

Construction Phase				
Impact Study	Impact #	Impact Type	Significance	
			Without mitigation	With mitigation
Ecological	1	Loss of Degraded thicket	LOW-	LOW-
	2	Loss of Fynbos	LOW-	LOW-
	3	Loss of Fynbos, Thicket, Karoo mosaic	LOW-	LOW-
	4	Loss of Thicket mosaic	LOW-	LOW-
	5	Loss of plant species of special concern	HIGH-	LOW-
	6	Loss of animal species of special concern	LOW-	LOW-
	7	Loss of Biodiversity	MOD-	LOW-
	8	Fragmentation of vegetation and edge effects	LOW-	LOW-
	9	Invasion of alien species	MOD-	MOD+
Avifauna	10	Habitat destruction	LOW-	LOW-
	11	Disturbance of birds	MOD-	LOW-
Bat	12	Destruction of bat foraging habitat	MOD-	LOW-
	13	Destruction of bat roosts	MOD-	LOW-
Heritage	14	Impact on heritage resources	MOD-	LOW-
Noise	15	Potential construction noise sources (construction vehicles)	LOW-	LOW-
Visual	16	Impact of construction activities on sensitive visual receptors	HIGH-	HIGH-
	17	Intrusion of large, highly visible wind turbines on the existing views	HIGH-	HIGH-
	18	Impact of night lights of a wind farm on existing nightscape	MOD-	MOD-
Agriculture	19	Loss of vegetation	VERY HIGH-	HIGH-
	20	Pollution of water sources	HIGH-	MOD-
	21	Erosion and construction on land with a gradient	VERY HIGH-	MOD-
Socio Economic	22	Temporary stimulation of the national and local economy	HIGH +	HIGH +
	23	Temporary increase in employment in the national and local economies	MOD +	MOD +
	24	Contribution to skills development in the country and local economy	MOD +	MOD +
	25	Temporary increase in household earnings	MOD +	MOD +
	26	Temporary increase in government revenue	MOD +	MOD +
	27	Negative changes to the sense of place	MOD -	MOD -
	28	Negative impact on the local tourism, game industry and associated industries	MOD -	LOW -
	29	Temporary increase in social conflicts associated with the influx of people	MOD -	LOW -
	30	Impact on economic and social infrastructure	MOD -	LOW -
	31	Impact on real estate dynamics and business activity in the immediately affected area	HIGH -	MOD -

Table 6-1b: Summary of the impacts associated with the proposed Plan 8 Grahamstown Wind Energy Project during the operational phase

Operational Phase				
Impact Study	Impact #	Impact Type	Significance	
			Without mitigation	With mitigation
Ecological	1	Invasion of alien species	HIGH-	MOD+
Avifauna	2	Bird collision and electrocution on overhead power lines, Impact on Red Listed and other species	MOD -	LOW -
	3	Bird disturbance and displacement from area as result of wind turbines and other infrastructure	LOW -	LOW -
	4	Bird collision with turbine blades	MOD -	MOD -
Bat	5	Bat mortalities during foraging by turbine blades	HIGH-	MOD-
	6	Bat mortalities during migration by turbine blades	HIGH-	MOD-
Heritage	7	Impact on heritage resources	MOD-	LOW-
Noise	8	Predicted noise levels for wind turbine generators	HIGH-	LOW-
Visual	9	Potential landscape impact	MOD-	MOD-
	10	Impact of shadow flicker on residents in close proximity to wind turbines	LOW-	LOW-
Agriculture	11	Possible change of use of agricultural land	MOD-	LOW-
Socio Economic	12	Sustainable increase in production and GDP-R nationally and locally	MOD +	MOD +
	13	Creation of sustainable employment positions nationally and locally	MOD +	MOD +
	14	Skills development of permanently employed workers	MOD +	MOD +
	15	Improved standards of living for the benefiting households	MOD +	MOD +
	16	Sustainable increase in national and local government revenue	MOD +	MOD +
	17	Local economic and social development benefits derived from the project's operations	HIGH +	HIGH +
	18	Negative changes to the sense of place	MOD -	MOD -
	19	Negative impact on local tourism, game farming and associated industries	MOD -	MOD -
	20	Negative impact on the livelihoods of the household's dependant on the local tourism, game farming and association industries	HIGH -	MOD -

Table 6-1c: Summary of the impacts associated with the proposed Plan 8 Grahamstown Wind Energy Project assuming the No-Go option

		No Go		
	Impact Study	Impact #	Impact Type	Significance
CONSTRUCTION	Ecological	1	Loss of Degraded thicket	MOD-
		2	Loss of Fynbos	MOD-
		3	Loss of Fynbos, Thicket, Karoo mosaic	MOD-
		4	Loss of rocky Fynbos	N/A
		5	Loss of Thicket	N/A
		6	Loss of Thicket mosaic	MOD-
		7	Loss of plant species of special concern	MOD-
		8	Loss of animal species of special concern	MOD-
		9	Loss of Biodiversity	MOD-
		10	Fragmentation of vegetation and edge effects	LOW-
		11	Invasion of alien species	HIGH-
	Avifauna	12	Habitat destruction	N/A
		13	Disturbance of birds	N/A
	Bat	14	Destruction of bat foraging habitat	N/A
		15	Destruction of bat roosts	N/A
	Heritage	16	Impact on heritage resources	MOD+
	Noise	18	Potential construction noise sources (construction vehicles)	MOD+
	Visual	19	Impact of construction activities on sensitive visual receptors	N/A
		20	Intrusion of large, highly visible wind turbines on the existing views of sensitive visual receptors	N/A
		21	Impact of night lights of a wind farm on existing night scape	N/A
	Socio-Economic	See Table 6.1d		

	Impact Study	Impact #	Impact Type	Significance
OPERATIONAL	Ecological	1	Invasion of alien species	HIGH-
	Avifauna	2	Bird collision and electrocution on overhead power lines, Impact on Red Listed and other species	N/A
		3	Bird disturbance and displacement from area as result of wind turbines and other infrastructure	N/A
		4	Bird collision with turbine blades	N/A
	Bat	5	Bat mortalities during foraging by turbine blades	N/A
		6	Bat mortalities during migration by turbine blades	N/A
	Heritage	7	Impact on heritage resources	MODERATE+
	Agriculture	8	Not proceeding with wind farm construction	MODERATE-
	Noise	9	Predicted noise levels for wind turbine generators	MODERATE+
	Visual	10	Potential landscape impact	MODERATE+
		11	Impact of shadow flicker on residents in close proximity to wind turbines	N/A
Socio-economic	See Table 6.1d			

Table 6-1d: Socio-economic impacts

The potential losses to the local game farm/hunting, tourism and associated industries due to the construction of the WEF could range between R 0.1 million and R 3.9 million per annum for domestic tourists and R 0.5 million and R 6.8 million for international tourists at 2018 prices. (The combined total potential losses were estimated in 2013 to be between R 1.3 million and R 8.3 million, inflation adjusted to 2018 figures.)

Potential estimated production losses associated with visual impacts (R' millions; 2018 prices)

	Scenario 1		Scenario 2		Scenario 3	
	Low degree of visitor sensitivity		Moderate degree of visitor sensitivity		High degree of visitor sensitivity	
Change in international tourist visitors	High & moderate visual exposure	Low visual exposure	High & moderate visual exposure	Low visual exposure	High & moderate visual exposure	Low visual exposure
	R1.1 million	R0.5 million	R4.1 million	R2 million	R6.8 million	R3.4 million
Change in domestic tourist visitors	High & moderate visual exposure	Low visual exposure	High & moderate visual exposure	Low visual exposure	High & moderate visual exposure	Low visual exposure
	R0.4 million	R0.1 million	R2.4 million	R0.9 million	R3.9 million	R1.9 million

Estimated impact on the national and local economies compared between 2013 report and 2018 proposed amendments (R' million, 2018 prices)

2018 Values			
Direct	Indirect	Induced	TOTAL
Impact on Production			
R 952,03	R 1 030,99	R 401,76	R 2 384,51
Impact on Gross Domestic Product per Region			
R 284,02	R 401,83	R 151,78	R 837,64
2013 Values (Inflation Adjusted)			
Direct	Indirect	Induced	TOTAL
Impact on Production			
R 536,30	R 599,19	R 216,58	R 1 352,08
Impact on Gross Domestic Product per Region			
R 124,44	R 209,60	R 81,86	R 415,91

Estimated Full Time Equivalent positions to be created during construction (2013 and 2018 values)

2018 Values			
Direct	Indirect	Induced	TOTAL
307	1 940	802	3 049
2013 Values			
Direct	Indirect	Induced	TOTAL
142	897	370	1 410

Comparison of no-go option to Grahamstown WEF development for operational phase

Potential annual losses from a reduction in tourist numbers (hunting included)	Total positive impacts of the operational expenditure (OPEX) in South Africa as a result of the Grahamstown WEF	Total FTE employment positions created during the operation phase of the Grahamstown WEF
<ul style="list-style-type: none"> R 0.1 million – R 6.8 million 	<ul style="list-style-type: none"> R 20.6 million – Production impact R 9 .1 million GDP-R impact 	<ul style="list-style-type: none"> 10 direct FTE positions 16 indirect FTE positions 10 induced FTE positions
	<ul style="list-style-type: none"> Impacts include the CAPEX impacts – local content 	<ul style="list-style-type: none"> Impacts include the CAPEX impacts – local content

7 ENVIRONMENTAL SPECIFICATIONS: CONSTRUCTION AND OPERATIONAL PHASES

This Chapter of the EMPr outlines the environmental specifications That must be implemented for the construction and operational phases of the Plan 8 Grahamstown Wind Energy Project. The specifications are based on the mitigation measures recommended in the Specialist Reports.

It is important to note that, in addition to the above, specific environmental specifications for particularly sensitive/specific areas within the proposed site have also been included in this section (**in boxes**).

Comprehensive environmental audits must be conducted periodically during the construction and operation phases, as discussed in Chapter 5, in order to verify compliance with the measures described below, the recommendations contained within the EIA Report and all applicable environmental legislation. If compliance with any of these measures cannot be achieved it will be the responsibility of the Contractor to motivate for this non-compliance.

7.1 Site Plan

The contractor must establish his construction camps, offices, workshops, staff accommodation (if any) and testing facilities on the site in a manner that does not adversely affect the environment. Before construction can begin the contractor must submit to the engineer for his approval a site layout plan detailing plans of the exact location, extent and construction details of these facilities and the impact mitigation measures the contractor proposes to put in place. In particular, this plan must include:-

- Site access (including entry and exit points).
- Access and haulage routes.
- All material and equipment storage areas (including storage areas for hazardous substances such as fuel and chemicals). Only designated areas may be used for the storage of materials, machinery, equipment and site offices.
- Construction offices and other structures (accommodation for staff, where required and considered appropriate). The site offices should not be placed in close proximity to steep areas. Preferred locations are flat areas within the proposed project area. The ecological specialist should be consulted as to the positioning of temporary structures.
- Areas where construction vehicles will be serviced.
- Security requirements (including temporary and permanent fencing, and lighting) and accommodation areas for security staff.
- Areas where vegetation will be cleared.
- The locality as well as the layout of the temporary waste storage facilities for litter, kitchen refuse, sewage and workshop-derived effluents. Waste storage facilities for sewage, grey water and workshop-derived effluents, where no formal facilities exist.
- Stormwater control measures.
- Provision of potable water and temporary ablution facilities.
- Potential pollution hazards and mechanisms to manage these.
- Intended mitigation measures regardless of the chosen site for approval by the ECO.

The site plan must submitted no later than the first site meeting. Detailed, geo-referenced electronic colour photographs shall be taken of the proposed site before any clearing may commence. These records are to be kept by the engineer for consultation during rehabilitation of the site.

Throughout the construction period the Contractor must restrict all activities to within the designated areas on the approved construction layout plan. Any relaxation or modification of the construction layout plan must be approved in writing by the ECO.

7.1.1. Water for Human Consumption

Water for human consumption must be available at the site offices and at other convenient locations on site.

7.1.2. Heating and Cooking Fuel

The Contractor must provide adequate facilities for his staff so that they are not encouraged to supplement their comforts on site by accessing what can be taken from the natural surroundings. The Contractor must ensure that energy sources are available at all times for construction and supervision personnel for heating and cooking purposes.

7.1.3. Sewage Management

All effluent from the sanitary facilities at the camp and office sites must be disposed of or stored in a properly designed and constructed system, situated so as not to adversely affect water sources (such streams, rivers, pans, and dams). Only domestic wastewater is allowed to enter this system.

Particular attention in the site establishment plan must be given to the management of sewage generated at the site offices, and on-site facilities for labour. Sanitary arrangements must be to the satisfaction of the ESO and/or ECO, the local authorities, and must conform to all applicable legal requirements.

Safe and effective management will require the use of chemical toilets which are supplied and maintained. The type of sewage management will depend on the geology of the local area, the duration of the contract and proximity (availability) of providers of chemical toilets. Chemical toilets must be serviced and emptied on a regular basis and no overflow will be permitted. The positioning of the chemical toilets is to be done in consultation with the ESO and/or ECO. The appropriate permits for sanitation facilities must be obtained from the local authorities.

Ablution Facilities

- The Contractor must provide the necessary ablution facilities for all his employees. These must be easily accessible (within 500m of any point of work), transportable and there should be a minimum of 1 toilet per 15 persons.
- Performing ablutions outside the toilet facilities is strictly prohibited. Use of the veld for this purpose shall not, under any circumstances, be allowed.
- The toilets shall be secured, and provided with an external closing mechanism to prevent toilet paper from being blown out.
- The toilets must be sited more than 50m away from any identified environmentally sensitive areas, drainage lines and water resources.
- Only approved chemical toilets shall be used.
- The Contractor shall arrange for regular emptying of toilets (toilets must be emptied on a daily basis) and will be entirely responsible for enforcing their use and for maintaining these facilities in a clean, orderly and sanitary condition to the satisfaction of the ESO and/or ECO.

7.2 Vegetation

Construction Phase

The following mitigation measures must be implemented to ensure the least possible impact on the local vegetation:

- The Contractor has a responsibility to inform all staff of the need to be vigilant against any practice that will have a harmful effect on vegetation. This information must form part of the Environmental Education Programme to be implemented by the Contractor.
- The natural vegetation encountered on the site is to be conserved and left as intact as possible.
- Removal or clearance of vegetation must be kept to a minimum.
- No construction will take place in areas of high sensitivity i.e. “No-Go Areas”, except where the EIA Report has indicated that it is acceptable or unavoidable for the development of wind

turbines in areas of high sensitivity with the implementation of mitigation measures. All No-Go areas must be demarcated with red tape under guidance of the ECO and a professional botanist.

- It is recommended that areas containing species of special concern be noted and every effort made to reduce the impacts of construction on these sections of vegetation.
- Every effort must be made to rehabilitate the damaged vegetation to minimise the habitat losses to resident faunal species.
- Re-vegetation of disturbed areas must be undertaken with site indigenous species and in accordance with the instructions issued by the ECO.
- Areas within the footprint of the development must be examined prior to any earthworks being carried out to determine if there are any endangered plants or SSC, which should then be removed by a professional botanist and, where possible, replanted in a suitable area. Prior to removal, however, suitable relocation areas need to be identified, either within the site or in other disturbed areas on the property.
- Some SSC will not transplant. These individuals should, as far as possible, be left untouched.
- Only trees and shrubs directly affected by the works, and such others as may be indicated by the ECO in writing, may be felled or cleared.
- The ECO must undertake a targeted survey of protected trees to identify any individuals of protected species. These must be marked with red tape.
- A permit must be obtained from the Department of Agriculture, Forestry and Fisheries (DAFF) prior to the removal or damage of any protected tree species.
- Sensitive areas adjacent to the construction area, including all potential habitats for threatened species, must be clearly demarcated and no construction activities or impacts must be permitted to occur across these demarcations. Demarcated areas must be fenced off or clearly demarcated with red tape and no personnel or equipment must be permitted to enter these areas.
- The project specification for the rehabilitation of grass cover must be strictly adhered to.
- Any proclaimed weed or alien species that germinates during the contract period must be cleared by hand before flowering.
- Open fires are not permitted on the construction site. Where required, fires will only be allowed in facilities or equipment specially constructed for this purpose.
- A firebreak must be cleared and maintained around the perimeter of the site camp and office site.
- A strict monitoring plan must be implemented to prevent the additional spread and the continued removal of alien species such as those of *Acacia*, *Pinus* and *Eucalyptus* species, which were already present on site or that become established on areas that were disturbed during construction.

Operational Phase

Management of the development area during the operational phase must focus on maintaining biodiversity and managing alien invasion. Achieving these objectives will require the preparation of an Alien Eradication Plan, and a Biodiversity Protection Plan. The latter will need to determine, *inter alia*, frequency of burning and/or mowing, areas to be left undisturbed etc.

The following applies with regards to vegetation during the operation phase:

- Continued monitoring of the site for potential alien invasion must take place, especially of plant species that were already on site.
- Maintenance of areas set aside within the site for conservation must take place to ensure that these are not being impacted further in any way.

7.3 Rehabilitation

The construction areas and areas where site offices were erected must be rehabilitated at the end of the contract. The area will require ripping and the re-spreading of topsoil to generate vegetation. In this regard, the following rehabilitation strategies apply:-

- Suitable plant species for re-vegetation must be determined early in the re-vegetation programme.
- Depending on the variation in soil types on the micro-scale it will be important to differentiate different soil characteristics during rehabilitation from the point of view of separating soil types. The correct soil types must be replaced in the areas from which they were originally removed. This is important as it relates to rehabilitated plants which may only grow in specific soil types. A horticultural specialist shall be brought in to over-see this task.
- Rehabilitation must be scheduled to take place as soon as possible after construction has been completed, with acceptable cover being achieved after three months.
- On-going monitoring and maintenance of rehabilitation works must be undertaken, especially following construction of any roads or digging of trenches for cables.
- All construction material, including concrete slabs, is to be removed from the site on completion of the contract. On no account must construction material be buried on the site.
- An indigenous re-vegetation strategy must be developed and implemented, especially of disturbed areas. This can provide a buffer to protect remaining indigenous vegetation from invasion by weeds and alien invader plants.

During the re-vegetation / rehabilitation programme, the following applies:

- A botanist/ecologist must be on site to determine if any of the SSC occurs where the turbines and associated infrastructure are positioned.
- Before the clearing of the site is authorised the appropriate permission must be obtained from the Department of Agriculture, Forestry and Fisheries (DAFF) for plants listed in the National Forests Act, and from the Provincial Nature Conservation Ordinance (PNCO) Schedule 4 protected species.
- In order to acquire a permit to destroy or remove plant species that fall under the National Forest Act an application form must be submitted to DAFF. A letter must be drafted and sent to DEA prior to the destruction\removal of any PNCO Schedule 4 species: This letter must list the species that will be removed or destroyed and the reason for their removal or destruction.
- These permits may be subject to certain conditions, for example allowing various nurseries to collect plants before vegetation clearance commences; and the removal of certain species for rehabilitation purposes.
- The plants can also be removed and placed in a nursery for use for rehabilitation purposes. If a species is identified for relocation, individuals of the species must be located within the proposed site, before vegetation clearing commences, and carefully uprooted and removed by a skilled horticulturist. Prior to removal, however, suitable relocation areas must be identified, either within the site or in other disturbed areas on the property. Individual plants that cannot be relocated at the time of removal should be moved to the nursery.
- It should be noted that many critical SSC are plants that will not be able to be successfully uprooted and replanted at all, or at best may have a low survival rate. In all cases the species will require very careful treatment to give them the best chances of survival, and specialist horticultural knowledge will be needed.

7.4 Fauna

The following measures must be implemented:

- During construction, sensitive habitats must be avoided by construction vehicles and equipment, wherever possible. Only necessary damage may be caused and, for example, unnecessary driving around in the veld or bulldozing natural habitat must not take place.
- Construction activities must remain within defined construction areas. No construction / disturbance will occur outside these areas.
- The extent of lay down areas must be minimised and they may not be located in areas that provide habitat for any faunal SSC.
- The Contractor must ensure that all identified highly sensitive habitats are protected by demarcated no-go areas through fencing or other suitable means.
- The Contractor must establish a relocation plan of action for important floral species within the defined construction area to be taken in conjunction with the conservation authorities to protect

or translocate any plant populations encountered during project implementation.

- Buffer zones must be provided around sensitive habitats.
- If any fencing is to be done; the fences should have enough space between wires for small animals to move across them uninhibited.
- The removal, damage or disturbance of fauna or avifauna will be forbidden in all demarcated no-go areas or specified environmentally sensitive areas.
- The ECO will make the Contractor aware of any Ordinances, Acts, by-laws or regulations relating to the protection of fauna on the site. Where applicable the Contractor must apply for the necessary permits prior to removing any animals listed in the relevant schedules promulgated in terms of any relevant legislation.
- The trapping of any animal is strictly prohibited. Any animal killed as a result of trapping or hunting or found in the possession of an employee of the Contractor will result in that employee being removed from site for the duration of the Contract.
- No domestic pets or livestock will be permitted on site during the construction period.

7.4.1. Birds and Bats

Due to the potential fatalities of birds and bats resulting from the proposed project, Plan 8 shall take every precaution in reducing the number of these animals that die as a result of the wind turbines and associated infrastructure.

The following mitigation measures should be used to reduce the number of mortalities:

- Wind turbines should have technology that reduces the amount of noise produced by their moving parts. This will especially reduce the disturbance to nesting birds.
- Associated infrastructure such as power lines also impact on birds. Where possible cabling and/or power lines must be buried, and not put on poles and run overland. Where this is not possible the power line must be marked with a suitable marking device for collision-prone species.
- Intermittent lighting must be used if possible, as well as red light which is less attractive than white light. Types and colours of lighting must be in accordance with the relevant requirements of aviation legislation and regulations.
- Markings on the tips of rotor blades can reduce the effects of motion smear by defining the swept area of the blade. However, since the blades are not manufactured in South Africa the markings are in different colours and in different places according to the practices of the overseas manufacturers.
- Monitoring for at least the first two years of operation must take place by an independent specialist. If high bird and /or bat mortalities are recorded then the operator of the wind farm must investigate additional mitigation measures such as emitting broadcasts of a certain radio frequency to discourage birds from entering high collision areas.

As turbine rotor size does not affect bat fatalities, but turbine height above ground does, some mitigation measures can be implemented to reduce bat fatalities. These are:

- The SA Bat Assessment Association (SABAA) guidelines (SABAA 2016) recommend that turbines should be sited away from areas of high bat sensitivity, to ensure that no part of the rotor blades encroach into the buffer zones of such areas. Micro-siting turbines (that is, moving turbines about the length of the rotor blades) whose bases are outside the buffer zone will comply with this guideline.
- Broadcasting ultrasound can deter bats from flying into wind turbines.
- Turbine operating times, particularly for turbines found to be causing high bat mortality, should be restricted during times when bat activity is high. Bats are at higher risk of fatality on nights with low wind speeds.
- Bat fatalities and their causes at the wind farm must be monitored, as there is little information available for wind farms in South Africa. More applicable mitigation measures can be applied when there is more information.

As noted in the Avifauna Specialist Study the following programme is proposed for all phases of

the project. This is applicable to bat mortalities and should therefore be implemented with the aim of monitoring both bird and bat mortalities. The monitoring programme is as follows:

- A suitably qualified avifaunal specialist should supervise the monitoring programme, train the necessary observers, collate, analyse, report and publish data.
- This specialist should be contracted by Plan 8.
- The first step for the appointed specialist will be to identify the key information required in the protocol below. This will be best done through a short site visit, which will also serve to train the identified observers and generally iron out any teething problems with the methodologies.
- The bulk of the actual work involved should be done by trained observers, under the guidance and supervision of a qualified and experienced ornithologist. This role could be filled by a number of people or entities, but will need to be the same entity for the duration of the programme.
- The specialist could advise the developer on available options to source observers.

7.5 Specific challenges in a southern African context:

The avifauna monitoring protocols that are available from Europe and the USA are mostly aimed at estimating population densities of small passerines in a relatively small study area. In southern Africa the majority of priority species are large species that are relatively thinly distributed. Specific challenges in a local context are the following:

- Some priority species are sparsely distributed with large territories, such as many of the large raptors and cranes. These species could easily be missed during surveys, especially short-term surveys.
- Some priority species are nomadic with fluctuating densities related to habitat conditions, particularly rainfall: bustards, for instance. To cover all possible conditions in the study area would require an effort which will be impractical, both in terms of resources and length of monitoring time.
- Some of the sites are extremely remote and access restricted. This means that sample size will be determined by what is practically possible, introducing bias towards areas within the study area which are accessible, and potentially missing important habitat. This is fortunately not the case at the proposed Grahamstown site.
- Limited availability of suitably experienced individuals that can do monitoring.

The suggested monitoring protocol is an attempt to address the challenges listed above whilst still maintaining a measure of practical realism as to what is possible with limited resources.

7.6 Aims of monitoring:

1. To estimate an abundance index for all the priority species within the wind farm area as a baseline to measure potential **displacement** due to the construction and operation of the wind farm.
2. To estimate the risk of priority species **colliding** with the wind turbines by recording flight behaviour. Recommended method is **vantage point observations**.

A) Pre-construction monitoring

(i) Displacement due to the construction and operation of the wind farm:

Methodology for calculating an abundance index using line transects:

- Establish boundaries for the wind farm area (including buffer zones), taking into account the priority species likely to be present, for the area to be surveyed (hereafter referred to as the wind farm area). The experience of the ornithologist will be priority in establishing the buffer zones, the decision to include an area will depend on the priority species that are likely to be present in the wind farm area. It is important that this is done realistically and objectively, taking into account the potential impacts of the wind farm and the availability of resources to conduct the monitoring.
- Identify, delineate and calculate the percentage of each distinct habitat type from a priority species perspective in the wind farm area using a combination of satellite imagery (Google

Earth) and GIS tools e.g. agricultural land, ridges, fynbos, woodland.

- Within the study area, selection of transects will largely depend on practical factors e.g. access, but ideally transects should cover as much as possible of the study area, and be as representative as possible of all the habitat types.
- Line transects should be counted in summer (from November to March) and in winter (May to August). Transects should be counted at least four times per season. A proposed practical method is for the observer to drive very slowly with a vehicle and stop every 250m and scan the surrounding habitat with binoculars in a 360° radius. All priority species must be recorded. The following data must be recorded:
 - Date of count
 - Number of count (each count must be numbered individually)
 - Duration of count i.e. the time it has taken to travel the transect (s)
 - Species
 - Weather conditions
 - Habitat type where the bird is recorded - overflying birds should be noted as such and not linked to a habitat type. In this respect the judgment of the observer will be crucial e.g. a bird that is foraging on the wing in a specific habitat type (e.g. a Black Harrier quartering in fynbos) should be distinguished from a bird that is obviously passing through.
- Ideally a similar exercise should be conducted for a control site of similar habitat composition and size, to make post-construction comparisons meaningful. There may be merit in use of shared control or reference sites for several wind farms in a well-defined geographical area. Control sites should have the following characteristics:
 - Host a similar mix of bird species present on the wind farm development site.
 - Be similar in size to the wind farm area.
 - Be located on ground with a similar mix of habitats and similar topography and aspect.
 - Be as closely matched as possible to the wind farm site, the main difference being the absence of wind turbines from the control.
 - Be situated as close as possible to the wind farm area without its bird populations being so close as to be affected by wind farm operations.
- It is important to record information on priority species occurrence from secondary sources, for example CAR counts or local bird watchers as well. Although this information cannot be analysed as part of the formal protocol, it is nonetheless important, especially if the source is reliable. Typical examples would be if the existence of nesting sites on the property which is known to the landowner. This should be incorporated into the final report.

Output:

- The main output of the transect monitoring is an abundance index for priority species expressed as species/km for both the wind farm area and the control area. This information will feed into the avifaunal specialist report for the EIA study.

(ii) Collision risk:

Methodology for estimating collision risk using vantage point (VP) observations:

- Vantage point (VP) observations are a means of quantifying flight activity of priority species that take place within the wind farm area, with the principal aim of determining the likely collision risk.
- The purposes of vantage point watches are to collect data on priority species that will enable estimates to be made of:
 - The time spent flying over the defined survey area;
 - The relative use of different parts of the defined survey area;
 - The proportion of flying time spent within the upper and lower height limits as determined by the rotor diameter and rotor hub height.
 - The flight activity of other species - secondary species using the defined survey area.
- When selecting VPs, the aim should be to cover all of the survey area such that no point is greater than 2km from a VP, but this is not always feasible.
- It is very important that VPs are chosen in order to achieve maximum visibility with the minimum number of points.

- Typically, a site measuring 1000ha will require at least 2 VP's.
- As acuity of observations will decrease with distance, VPs should be located as close to the survey boundary as possible.
- VPs should not be located near to the nest site of target species and observers should try to position themselves inconspicuously so as to minimise their effects on bird movements.
- Coordinates of VPs must be recorded using a GPS. Observers should take care to re-use the exact VP location in successive watches.
- VP observations should be conducted in summer (November to March) and in winter (May to August). A total of 18 hours (two days) of vantage point (VP) observations pre- and post-construction per season per VP should be conducted. VP watches should be conducted in three hour shifts, to account for different levels of bird activity:
 - Shift 1: starting one hour before dawn sunrise?
 - Shift 2: starting noon
 - Shift 3: starting two hours before sunset until visibility becomes too low
- The following data must be recorded at the start of the watch:
 - Watch number
 - Date
 - Start time
 - Wind strength (light, moderate, strong)
 - Wind direction
 - Flight activity for priority species must be recorded in the following manner (number each flying bout consecutively), the use of markers on laminated maps are strongly recommended:
 - Species
 - Flight duration (starting at time of detection until bird disappears from view)
 - Flight height (below the rotor arc; within the rotor arc; above the upper rotor arc - recorded at 15 second intervals until bird disappears from sight)
 - Flight direction recorded at 15 second intervals until bird disappears from sight.
 - Flight mode recorded at 15 second intervals until bird disappears from site (soaring, gliding, flapping)
- Estimation of predicted collision mortality can be undertaken with a model such as that developed by SNH (Scottish Natural Heritage 2000b). Band et al (2007) provide further details, worked examples and discussion. The model leads to an initial estimate of collision risk based on the theoretical assumption that birds take no avoiding action. It is then necessary to build in a more realistic expectation that a high proportion of birds are likely to take avoiding action successfully (see SNH 2000a). Limited information on avoidance rates is available for some species, based on experience at actual wind farms (see SNH 2004). With time, avoidance rates for SA species will need to be established.

B) Post-construction monitoring

Aims:

- To compare the abundance index for all the priority species within the development area after construction against the pre-construction baseline to measure actual displacement due to the construction and operation of the wind farm. Recommended survey method is line transect counts (see A above).
- To estimate the risk of priority species colliding with the wind turbines by recording actual collisions and comparing post-construction flight patterns with pre-construction baseline data. Recommended methods are carcass searches and VP watches (see A above).

(iii) Displacement due to the construction and operation of the wind farm:

Methodology for calculating abundance conducted in two seasons of years 1, 2, 3, 5, 10 and 15; after the wind farm becomes operational. Bird responses to wind farms may operate over very long periods of time, and that monitoring needs to take this into account, as results from short term observational index using line transects:

- Methodology has been fully covered under A above.
- Ideally, surveys should be studies are unlikely to be representative.

(iv) Collision risk***Methodology for estimating actual collision rates using carcass searches:***

- Carcass searches are the most direct way of estimating the number of collisions and hence the likely impact on species of conservation importance. Measures of the number of collisions can also help to quantify avoidance rates (as used in collision risk modelling calculations), and, when collisions can be ascribed to a particular time, contribute to an understanding of environmental conditions and behaviours that increase collision risk.
- The value of surveying the area for collision victims only holds if some measure of the accuracy of the survey method is developed. To do this, a sample of suitable bird carcasses (of similar size and colour to the priority species – e.g. Egyptian Goose *Alopochena aegyptiaca*, domestic waterfowl and pigeons) should be obtained and distributed randomly around the site without the knowledge of the surveyor, some time before the site is surveyed. This process should be repeated opportunistically (as and when suitable bird carcasses become available) for the first two months of the monitoring period, with the total number of carcasses not less than 20. The proportion of the carcasses located in surveys will indicate the relative efficiency of the survey method.
- Simultaneous to this process, the condition and presence of all the carcasses positioned on the site should be monitored throughout the initial two-month period, to determine the rates at which carcasses are scavenged from the area, or decay to the point that they are no longer obvious to the surveyor. This should provide an indication of scavenge rate that should inform subsequent survey work for collision victims, particularly in terms of the frequency of surveys required to maximise survey efficiency and/or the extent to which estimates of collision frequency should be adjusted to account for scavenge rate. Scavenger numbers and activity in the area may vary seasonally so, ideally, scavenge and decomposition rates should be measured twice during the monitoring year, once in winter and once in summer.
- The area within a radius of at least 50 m of each of the turbines (from the outer edge of rotor zone) at the facility should be checked regularly for bird casualties. The frequency of these surveys should be informed by assessments of scavenge and decomposition rates conducted in the initial stages of the monitoring period (see above), but they should be done at least weekly for the first two months of the study. The area around each turbine, or a larger area encompassing the entire facility, should be divided into quadrants, and each should be carefully and methodically searched for any sign of a bird collision incident (carcasses, dismembered body parts, scattered feathers, injured birds). All suspected collision incidents should be comprehensively documented, detailing the precise location (preferably a GPS reading), date and time at which the evidence was found, and the site of the find should be photographed with all the evidence in situ. All physical evidence should then be collected, bagged and carefully labelled, and refrigerated or frozen to await further examination. If any injured birds are recovered, each should be contained in a suitably-sized cardboard box. The local conservation authority should be notified and requested to transport casualties to the nearest reputable veterinary clinic or wild animal/bird rehabilitation centre. In such cases, the immediate area of the recovery should be searched for evidence of impact with the turbine blades, and any such evidence should be fully documented (as above).

Methodology for comparing post-construction flight patterns with pre-construction baseline data using Vantage point watches**7.7 Waste Management**

The Contractor's intended methods for waste management and waste minimisation must be approved by the ECO and implemented at the outset of the contract. All personnel shall be instructed to dispose of all waste in the proper manner.

No waste from construction or otherwise, may be disposed of on site. All waste generated on site must be removed from the site and disposed of at a licensed waste disposal site. In this regard, adequate litter drums or other suitable containers must be located on site to ensure that waste generated on site is disposed of in suitable and timeous manner. Bins should be securely covered

to prevent access by scavengers, and litter being blown out in windy conditions.

Where possible, as much as possible of the construction waste should be recycled and used in construction.

7.7.1. Solid Waste and liquid wastes

Construction Phase

Solid waste must be stored in a designated area within the site area in covered, tip proof drums for collection and disposal. All refuse containers must be free of any holes and in good condition. A refuse control system must be established for the collection and removal of refuse to the satisfaction of the ESO and/or ECO. As far as possible general non-hazardous waste, including paper, glass, plastics and metal, must be sorted for recycling.

Disposal of solid waste must be at a DEA licensed landfill site, or at a site approved by DEA in the event that an existing operating landfill site is not within reasonable distance from the site. No waste shall be burned or buried. Any water contaminated by cement must not be allowed to flow freely into the environment. Instead, it must be contained and solids allowed to settle out. Thereafter, the solid material must be disposed of to a landfill site with other solid waste.

7.7.2. Litter

Construction Phase

No littering by construction workers will be allowed. During the construction period the facilities must be maintained in a neat and tidy condition, and the site is to be kept free of litter. Fines shall be implemented for persons found littering.

All waste facilities must be secured with fixed lids to prevent any potential scavenging from wild animals such as monkeys and baboons.

Measures must be taken to reduce the potential for litter and negligent behaviour with regard to the disposal of all refuse. At all places of work the Contractor must provide litter collection facilities for later safe disposal at DEA-approved waste disposal sites.

Operational Phase

During the operation phase the area of the development should be cleared of litter on a regular basis. Once collected, this litter must be disposed of at a DEA approved waste disposal site.

7.7.3. Hazardous Waste

Construction Phase

Hazardous waste such as bitumen, oils, oily rags, paint tins and other material contaminated by hydrocarbons, must be disposed of at a DEA-licensed hazardous waste landfill site. Special care must be taken to avoid spillage of hazardous waste from entering the ground or contaminating water. In the event of the above occurring, the affected areas must be promptly reinstated to the satisfaction of the ECO.

As far as possible the maintenance of machinery and vehicles on site must be avoided. Used oil, lubricants and cleaning materials from the maintenance of vehicles and machinery must be collected in a holding tank and returned to the supplier. Water and oil must be separated in an oil trap. Oils collected in this manner must be retained in a safe holding tank and removed from site by a specialist oil recycling company for disposal at approved waste disposal sites for toxic/hazardous materials. Oil collected by a mobile servicing unit must be stored in the service unit's sludge tank and discharged into the safe holding tank for collection by the specialist oil recycling company. The Contractor must ensure that an Emergency Preparedness Plan is in place for implementation in the case of a spill or substances which can be harmful to an individual or the receiving environment.

All used filter materials must be stored in a secure bin for disposal off site. Hazardous waste must not be stored or stockpiled in any area other than that designated on the construction site layout.

Any contaminated soil must be removed and replaced. Soils contaminated by oils and lubricants must be collected and disposed of at a facility designated by the local authority to accept contaminated materials.

Washing of vehicles on the construction site will not be permitted as this is likely to result in release of hydrocarbon-contaminated wash water into the environment.

Operational Phase

Hazardous materials generated during the operation phase must be disposed of at a DEA-approved hazardous waste site. The Contractor must ensure that an Emergency Preparedness Plan is in place for implementation in the case of a spill or substances which can be harmful to an individual or the receiving environment.

7.8 Maintenance and Machinery

The contractor's management and maintenance of his plant and machinery must be strictly monitored according to the criteria given below, regardless of whether it is serviced on the site: that is, at the place of construction activity or at a formalised workshop.

7.8.1. Safety

All the necessary handling and safety equipment required for the safe use of petrochemicals and oils must be provided by the Contractor to, and used or worn by the staff whose duty it is to manage and maintain the supplier's plant, machinery and equipment.

7.8.2. Hazardous Material Storage

Petrochemicals, oils and identified hazardous substances must be stored only under controlled conditions. All hazardous materials such as oils, lubricants and paints must be stored in a secured, appointed area that is fenced and has restricted entry. Storage of hazardous products may only take place using suitable containers approved by the ECO.

The Contractor must provide proof to the Engineer that relevant authorisation to store such substances has been obtained from the relevant authority. In addition, hazard signs indicating the nature of the stored materials must be clearly displayed on the storage facility or containment structure. Before containment or storage facilities can be erected, the Contractor must furnish the Engineer with details of the preventive measures which are proposed to be implemented in order to militate against pollution of the surrounding environment from leaks or spillage. The proposals must also indicate the emergency procedures to be implemented in the event of misuse or spillage of substances that will negatively impact on an individual or the environment.

7.8.3. Fuel and Gas Storage

- Fuel must be stored in a secure area in a steel tank supplied and maintained by the fuel suppliers.
- Storage of fuel and gas must be confined to the demarcated secure area(s).
- Areas around fuel tanks are to be bunded or contained in an appropriate manner in accordance with the requirements of SABS 089:1999 Part 1.
- Fuel tanks must be located at least 3.5m from buildings, boundaries and any other combustible or flammable material.
- Leakage of fuel must be avoided at all times and if found to occur shall be remedied immediately. Suitable and adequate supplies of absorbents must be available at all times to control and absorb any spillages.
- The Contractor must ensure that an Emergency Preparedness Plan is in place for

implementation in case of leakage or spillage of fuel which can be harmful to an individual or the receiving environment.

- An adequate bund wall (110% of stored volume) must be provided for fuel and diesel areas to accommodate any spillage or overflow. The area inside the bund wall must be lined with an impervious material to prevent infiltration of the fuel into the soil.
- Where provision is made for draining water from a bunded area, such drains shall be so controlled as to prevent hazardous materials from entering natural water courses, public sewers or public drains.
- No storage of any combustible materials (paper, cardboard, wood etc.) will be permitted in any bunded area.
- Generators and fuel supply needed during construction must be placed on trays, which can rest on clean sand.
- Once construction has been completed, the contaminated sand must be removed from the site and disposed of at a registered waste site.
- All storage tanks must be removed after construction.
- Gas welding cylinders and LPG cylinders must be stored in a secure, well-ventilated area which is clearly marked with hazard signs.

7.8.4. Fires

Construction Phase

- Due to the frequent high winds at the site no open fires will be permitted on the site.
- Where fires are unavoidable, the Contractor must ensure the strict management and control of fires at construction camps and that education of the work force concerning management of fires is undertaken.
- The Contractor must ensure that camp fires at construction sites are strictly controlled to ensure that no veld fires are caused. This is especially important where fires may affect sensitive habitats.
- Fires shall only be allowed in facilities or equipment specially constructed for this purpose and these must be located in areas that are sheltered from the prevailing winds.
- A firebreak must be cleared and maintained around the perimeter of the camp and office sites at all times. The location of this firebreak will be decided with input from a local botanist and the ECO.

7.9 Clearing of the Site

In all areas where the contractor intends to, or is required to clear the natural vegetation and soil, either within the construction area, or at designated or instructed areas outside the construction area, a plan of action must first be submitted to the engineer and ECO for approval.

The plan must contain a photographic record and drainage / land reference of the areas to be disturbed. This must be submitted to the engineer for his records before any disturbance/stockpiling may occur. The record must be comprehensive and clear, allowing for easy identification during subsequent inspections.

The contractor must be responsible for the re-establishment of grass within the development boundaries for all areas disturbed during construction. This includes, for example, service roads, stockpile areas, stop/go facilities, windrows and wherever material generated from, construction has to be stored temporarily or otherwise within the construction area, or at designated or instructed areas outside the construction area. This responsibility will extend until expiry of the defects notification period.

7.10 Soil Management

7.10.1. Topsoil

Topsoil Must be removed from all areas where physical disturbance of the surface occurs, and shall be stored and adequately protected. The contract will provide for the stripping and stockpiling

of topsoil from the site for later re-use. Topsoil is considered to be the natural soil covering, and to include all organic matter. Topsoil depth may vary at each site, and must be determined for each individual site to be cleared and removed accordingly. The areas to be cleared of topsoil will include the storage areas and site camps.

All topsoil stockpiles and windrows must be maintained throughout the contract period in a weed-free condition. Weeds appearing on the stockpiled topsoil must be removed by hand. The topsoil stockpiles must be stored, shaped and sited in such a way that they do not interfere with the flow of water such that damming or erosion is caused, or itself be eroded through the action of water. Stockpiles of topsoil must not exceed a height of 2m, and if they are to be left for longer than six months must be analysed and, if necessary, nutrient levels replenished before replacement.

Soils contaminated by hazardous substances must be disposed of at a DEA-licensed hazardous waste disposal site.

The Contractor must ensure that minimal amounts of topsoil are lost due to erosion, either by wind or water. This can be facilitated through the grassing of topsoil stockpiles. Areas to be top-soiled and grassed must be done systematically to allow for quick cover and reduction in the chance of heavy topsoil losses due to unusual weather patterns.

The Contractor's programme shall clearly show the proposed rate of progress of the application of topsoil and re-vegetation. The Contractor will be held responsible for the replacement, at his own cost, for any unnecessary loss of topsoil due to his failure to work according to the progress plan approved by the ECO. The Contractor's responsibility will also extend to the clearing of drainage or water systems that may have been affected by such negligence within and beyond the boundaries of the road reserve.

7.10.2. Subsoil

The subsoil is the layer of soil immediately beneath the topsoil. This layer of soil must be removed to a depth instructed by the ECO, and stored separately from the topsoil if not used for construction purposes. During rehabilitation, this subsoil must be replaced in the excavation in the original order of layers in which it was removed.

7.11 Drainage

- The quality, quantity and flow direction of any surface water runoff must be established prior to disturbing any area for construction purposes. Cognisance must be taken of these aspects and incorporated into the planning of all construction activities.
- Before a site is developed or expanded, the effect on the drainage pattern as a result of this development or expansion must be established.
- Recognised water users/receivers must not be adversely affected by the expansion or re-development.
- No water source may be polluted in any way due to proposed changes.
- Streams, rivers, pans, wetlands, dams, and their catchments must be protected from erosion, direct or indirect spillage of pollutants such as refuse, garbage, cement, concrete, sewage, chemicals, fuels, oils, aggregate, tailings, wash water, organic materials and bituminous products.
- The Contractor must submit in writing to the Engineer and ECO his proposals for prevention, containment and rehabilitation measures against environmental damage of the identified water and drainage systems on the site. Consideration must be given to the placement of sedimentation ponds or barriers where the soils are of a dispersive nature, or where toxic fluids are used in the construction process. The sedimentation ponds must be large enough to contain runoff such that they function correctly under heavy rain conditions.
- Measures must be put in place to protect the hill slopes on site against erosion as a precaution in areas affected by the exposing of unconsolidated soils during construction of the wind energy facility.
- Storage containers must be regularly inspected to prevent leaks into the aquatic systems.

- Weather forecasts from the South African Weather Services of up to three days in advance must be monitored on a daily basis to avoid exposing soil or building works or materials during a storm event and appropriate action must be taken in advance to protect construction works should a storm event be forecast.

7.12 Earthworks and Layerworks

This section includes all construction activities that involve the excavation of all materials, and their subsequent placement, stockpile, spoil, treatment or batching, for use in the permanent works, or temporary works in the case of deviations. The contractor must take cognisance of the requirements set out below.

7.12.1. Excavation, hauling and placement

The contractor must provide the engineer and ECO with detailed plans of his intended construction processes prior to starting any excavations. The plans must detail the number of personnel and plant to be used and the measures by which the impacts of pollution (including noise, dust, litter, fuel, oil and sewage), erosion, vegetation destruction and deformation of landscape will be prevented, contained and rehabilitated. Particular attention must also be given to the impact that such activities will have on the adjacent built environment, including nearby houses. The contractor must demonstrate his “good housekeeping”, particularly with respect to closure at the end of every day so that the site is left in a safe condition from rainfall overnight or over periods when there is no construction activity.

7.12.2. Spoil sites

The contractor will be responsible for the safe siting, operation, maintenance and closure of any spoil site he uses during the contract period, including the defects notification period. This will include existing spoil sites that are being re-entered. Before spoil sites may be used, proposals for their locality, intended method of operation, maintenance and rehabilitation must be given to the engineer and ECO for his approval. The location of these spoil sites must have signed approval from the affected landowner before submission to the engineer. No spoil site may be located within 500m of any watercourse. A photographic record must be kept of all spoil sites for monitoring purposes. This includes before the site is used and after re-vegetation.

The use of approved spoil sites for the disposal of hazardous or toxic wastes is prohibited, because of the risk of toxins leaching into the environment. The same will apply for the disposal of solid waste generated from the various camp establishments.

The storage of excavated material on site must be minimised to avoid unnecessary impacts to the local environment. As soon as practical after excavation, if not simultaneously, all excavated material that is not required for construction or rehabilitation must be removed from the site for disposal at an appropriate location. This location must be agreed between the developer, engineer and local municipal officials prior to initiation of excavation.

7.12.3. Stockpiles

The contractor must plan his activities so that excavated materials, as far as possible, can be transported direct to and placed at the point where it is to be used. However, should temporary stockpiling become necessary, the areas for the stockpiling of excavated and imported material must be indicated and demarcated on the site plan submitted in writing to the engineer and ECO for their approval, together with the contractor’s proposed measures for prevention, containment and rehabilitation against environmental damage.

The areas chosen must have no naturally occurring indigenous trees and shrubs present that may be damaged during operations. Care must be taken to preserve all vegetation in the immediate area of these temporary stockpiles. During the life of the stockpiles the contractor must at all times ensure that they are:

- Positioned and sloped to create the least visual impact;

- Constructed and maintained so as to avoid erosion of the material, generation of dust and contamination of surrounding environment; and
- Kept free from all alien/undesirable vegetation.

After the stockpiled material has been removed, the site must be re-instated to its original condition. No foreign material generated / deposited during construction may remain on site. Areas affected by stockpiling must be landscaped, top soiled, grassed and maintained at the contractor's cost until clearance from the engineer and the relevant national regulatory authority is received. In all cases, the engineer must approve the areas for stockpiling and disposal of construction rubble before any operation commences and must approve their closure only when they have been satisfactorily rehabilitated.

7.12.4. Blasting

Wherever blasting is required on the site the contractor must rigorously adhere to the relevant statutes and regulations that control the use of explosives. In addition, the contractor must, prior to any drilling of holes in preparation for blasting, supply the engineer with a locality plan of the blast site on which must be shown the zones of influence of the ground and air shock-waves and expected limits of fly-rock. The plan must show each dwelling, structure and service within the zones of influence of the blast and record all details of the dwellings/structures/services including existing positions, lengths and widths of cracks, as well as the condition of doors, windows, roofing, wells, boreholes etc. The contractor, alone, will be responsible for any costs that can be attributed to blasting activities, including the collection of fly-rock from adjacent lands and fields. The submission of such a plan will not in any way absolve the contractor from his responsibilities in this regard.

The contractor must also indicate to the engineer the manner in which he intends to advertise to the adjacent communities and/or road users the times and delays to be expected for each individual blast. The Contractor will be responsible for obtaining all necessary permits required for blasting activities.

7.12.5. Batching sites

Plan 8. intend to erect a batching plant on site, and consequently the following specifications must be implemented.

Asphalt plants are considered scheduled processes listed in the second schedule to the Atmospheric Pollution Prevention Act, 1965 (Act No. 45 of 1965). Should the use of an asphalt plant be considered on site, the contractor will be responsible to obtain the necessary permit from the DEA, regardless of where they are sited.

Crushing plants and concrete batching plants will be subject to the requirements of the applicable industrial legislation that governs gas and dust emissions into the atmosphere. Such sites will be the subject of regular inspections by the ECO and relative authorities during the life of the project. The contractor must provide plans that take into account such additional measures as concrete floors, bunded storage facilities and linings to drainage channels. All sites must adhere to the following requirements:

- The batching activity will be located in an area of low environmental sensitivity to be identified and approved by the ECO.
- No batching activities will occur on unprotected substratum of any kind; that is, directly on the ground.
- All wastewater and runoff from batching areas must be strictly controlled, and cement-contaminated water must be collected, stored and disposed of at a site approved by the ECO. Mixing trays must be used at all mixing and supply points.
- Contaminated water must be disposed of at a waste disposal site approved by the ECO.
- Effluent from concrete batch plants and crusher plants must be treated in a suitable designated sedimentation dam to the legally required standards to prevent surface and

groundwater pollution. The designs of such a facility must be submitted to the ECO for approval.

- Contaminated water storage facilities must not be allowed to overflow, and appropriate protection from rain and flooding shall be implemented.
- Unused cement bags must be stored so as not to be affected by rain or runoff events.
- Used bags must be disposed of by the Contractor in the appropriate manner.
- Care must be taken to collect contaminated wash-water resulting from cleaning activities of equipment and flushing of mixers, and dispose of it in a manner approved by the ECO.
- Suitable screening and containment must be in place to prevent wind-blown contamination associated with bulk cement silos, loading and batching.
- All visible remains of excess concrete must be physically removed on completion of the plaster or concrete pour section and disposed of. All excess aggregate must also be removed.

Ultimate approval of these measures must be from the relevant national regulatory authority, as must approval of closure. The engineer will assist the contractor in his submissions to the relevant authority.

The contractor must invite the relevant department to inspect the site within two months after any plant is commissioned and at regular intervals thereafter.

7.13 Spillages

Construction Phase

Streams, rivers and dams must be protected from direct or indirect spillage of pollutants such as refuse, garbage, cement, concrete, sewage, chemicals, fuels, oils, aggregate, tailings, wash water, organic materials and tar or bituminous products. In the event of a spillage, the contractor will be liable to arrange for professional service providers to clear the affected area.

Responsibility for spill treatment lies with the contractor. The individual responsible for, or who discovers a hazardous waste spill must report the incident to his/her ESO, ECO or to the engineer. The ESO must assess the situation in consultation with the engineer and act as required. In all cases, the immediate response must be to contain the spill. The exact treatment of polluted soil / water must be determined by the contractor in consultation with the ESO, ECO and the engineer. Areas cleared of hazardous waste must be re-vegetated according to the engineer's instructions

Should water downstream of the spill be polluted, and fauna and flora show signs of deterioration or death, specialist hydrological or ecological advice must be sought for appropriate treatment and remedial procedures to be followed. The requirement for such input must be agreed with the engineer. The costs of containment and rehabilitation will be for the contractor's account, including the costs of specialist input.

Operational Phase

The Contractor must compile and maintain environmental emergency procedures to ensure that there will be an appropriate response to unexpected or accidental environment-related incidents throughout the life cycle of the project. These plans must include:

- Emergency organisation (manpower) and responsibilities, accountability and liability.
- A list of key personnel.
- Details of emergency services applicable to the various areas along the route that the turbine components will need to be transported as well as for the site itself, such as the fire department and spill clean-up services.
- Internal and external communication plans, including prescribed reporting procedures where required by legislation.
- Actions to be taken in the event of different types of emergencies.
- Incident management plans for the site.
- Incident recording, progress reporting and remediation measures required to be implemented.

- Information on hazardous materials, including the potential impact associated with each and measures to be taken in the event of accidental release.
- Training plans and testing exercises and schedules for effectiveness.

The Contractor must comply with the emergency preparedness and incident and accident-reporting requirements, as required by the Occupational Health and Safety Act, 1993 (Act No 85 of 1993), the National Environmental Management Act, 1998 (Act No 107 of 1998), the National Water Act, 1998 (Act No 36 of 1998) and the National Veld and Forest Fire Act, 1998 (Act No 101 of 1998) as amended and/or any other relevant legislation.

7.14 Areas of Specific Importance

Any area that has been determined and identified in the project documentation as sensitive or of special interest within the site must be treated according to the express instructions contained in these specifications or the approved EMPr. The contractor may offer alternative solutions to the engineer in writing should he consider that construction will be affected in any way by the hindrance of the designated sensitive area or feature. However, the overriding principle is that such defined areas requiring protection may not be changed. Every effort to identify such areas within the site will have been made prior to the project going out to tender. The discovery of other sites with archaeological or historical interest that have not been identified will require *ad hoc* treatment.

7.14.1. Archaeological, heritage or palaeontological sites

In terms of heritage impacts several archaeological sites exist in the shelters below the top of the hills on which the turbines for the project will be placed (within a 1km radius). The sites all occur along the slopes of the affected hills and will not be affected by the proposed project. Although the turbines will not affect these sites, it must be noted that servitudes must be placed in such a manner that they do not impact these sites.

If an artefact on site is uncovered, work in the immediate vicinity must be stopped immediately. The contractor must take precautions to prevent any person from removing or damaging any such article and must immediately upon discovery thereof inform the engineer of such discovery. The Eastern Cape Province Heritage Agency (ECPHA) must be contacted and they will appoint an archaeological consultant to record the site and excavate if necessary. Work may only resume once clearance is given in writing by the archaeologist.

7.14.2. Fossil finds

It is possible that palaeontologically important black shale lenses within the Witpoort Formation will be encountered during excavations on the site for turbine bases, access roads, hardstandings and cable trenches. Recent local experience indicates that these shales are likely to be fossiliferous, and measures are required to ensure that all the freshly exposed faces and bases of excavations in rock are inspected by a professional palaeontologist before they are covered over, allowed to weather, or plant growth occurs.

- All excavations in rock for turbine foundations must be examined by a palaeontologist immediately after excavation and before any concrete is poured.
- Excavations in rock for all access roads must be inspected by a palaeontologist for the presence of fossils prior to any further work is done to cover the exposed rock.
- Excavated rock is to be retained, unused for any other purpose, on the site until such time as the palaeontologist has had an opportunity to inspect the rock for the presence of fossils.
- Should any paleontologically important material be exposed, it must be sampled by a professional palaeontologist and accessioned into the collection of the Albany Museum in Grahamstown/Makhanda.

7.14.3. Graves and middens

If a grave or midden is uncovered on site, or discovered before the commencement of work, then all work in the immediate vicinity of the grave/midden must be stopped and the engineer informed

of the discovery. The National Monuments Council must be contacted and in the case of graves, arrangements made for an undertaker to carry out exhumation and reburial. The undertaker will, together with the National Monuments Council, be responsible for attempts to contact family of the deceased and for the site where the exhumed remains can be re-interred.

7.15 Noise Control

Construction Phase

- Construction will be restricted to normal daytime working hours (08:00–17:00). No construction activities will take place during weekday evenings and night-time (after 17:00), on Saturdays after midday (12:00) and the entire day on Sundays.
- No construction may take place on Public Holidays.
- No construction piling may occur at night. Piling may only occur during the hottest part of the day to take advantage of unstable atmospheric conditions.
- All noise-making machinery and equipment must be turned off when not in use.
- All machinery and equipment must be kept in good working order.
- All machinery and equipment must be operated within specifications and capacity (i.e. do not overload machines).
- Compliance with the appropriate legislation with respect to noise is mandatory.
- The Contractor must familiarise himself with, and adhere to, any local bylaws and regulations regarding the generation of noise.
- Construction staff must be given “noise sensitivity” training.
- The Contractor must endeavour to keep noise generating activities associated with construction activities to a minimum.
- Modern low noise emission vehicles, machinery and equipment must be favoured on site. The details of all construction vehicles, machinery and equipment must be determined prior to construction in order to identify potentially noisy vehicles, machinery and equipment and to seek possible alternatives. These details will include the manufacturer, type and noise emission data of each item of vehicles, machinery and equipment and how many will be used at any time. Note that manufacturers of modern vehicles, machinery and equipment provided for the international market are obliged to provide noise emission data. Where this information is not available, noise measurements must be conducted prior to use of such vehicles, machinery and equipment.
- A well planned and co-ordinated “fast track” procedure must be implemented to complete the total construction process in the area in the shortest possible time.
- The size of explosive charges used for blasting (if required) must be optimised so as to balance breaking capacity against minimising any noise and vibration impact and fly-rock.

Operational Phase

During operation of the wind energy facility, Plan 8 must ensure that the turbine infrastructure is maintained such that noise levels in identified noise sensitive areas associated with the Plan 8 Grahamstown Wind Energy Project do not exceed the legally acceptable level of 45 dB(A) for affected communities or households. A noise monitoring programme must be developed and implemented for at least the first two years of operation.

7.16 Dust Control

- Appropriate dust-suppression techniques as approved by the Engineer and ECO must be implemented on all exposed surfaces, especially during periods of high wind. Such measures must include; wet suppression, chemical stabilisation, use of wind fence covering surfaces with straw or chippings, and the re-vegetation of open areas.
- Water used for dust suppression must be applied in quantities small enough not to generate run-off and result in soil erosion.
- Mitigation actions such as the reduction of vehicle speed and proper signage must also be implemented.
- Blasting must be restricted to periods of calm wind conditions to minimise the potential for dust

dispersion.

- Vegetation cover must be maintained and vegetation cover only removed when soil stripping is required.
- Exposed soil that has the potential for generating dust must be re-vegetated or stabilised as soon as possible after construction work is completed, or kept damp until re-vegetation occurs.
- Excavation, handling and transport of topsoil and spoil must be avoided during periods of excessive wind.
- Adequate water carts must be available on site to meet demands throughout the duration of the contract.
- The Contractor must ensure that loose building materials and excavated material stockpiles are adequately protected against the wind by a covering such as canvas.
- Stockpiles must also be dampened to minimise dust generation.
- Construction vehicles and machinery must be serviced every month, with a major service every six months.
- Construction vehicles and machinery must be inspected for excessive emissions.

7.17 Control and Management of Alien Vegetation

Construction Phase

- Mitigation measures to reduce the impact of the introduction of alien invaders, as well as measures against alien invaders that have already been recorded on the site, must be actively maintained throughout both the construction and operation phases.
- The Contractor will be held responsible for the removal of alien vegetation within the development area disturbed for the duration of the construction phase. This includes, for example, access roads, stockpile areas, and wherever material generated for or from construction has been stored temporarily or otherwise within the development area.
- Any proclaimed weed or alien species that germinates during the contract period must be cleared by hand before flowering.
- Removal of existing alien species shall be consistently done
- Alien plants must be removed as soon as they are detected.
- Removed alien vegetation must be disposed of in accordance with the appropriate methods developed by the Working for Water Programme, and advice from this organisation must be obtained.
- Herbicides may be applied only by an appropriately-registered pest control operator, or such an operator must supervise the application of industrial herbicides, in compliance with the terms of the Fertilisers, Farm Feeds, Agricultural Remedies and Stock Remedies Act, 1947 (Act No 36 of 1947). The use of herbicides will not be permitted within identified sensitive areas. Removal of alien vegetation within these areas must be undertaken by hand.
- Re-vegetation of disturbed areas must be undertaken with site indigenous species.
- The Contractor must avoid translocating stockpiles of topsoil from one place to another in order to avoid translocating soil seed banks of alien species.
- Depending on the variation in soil types on the micro-scale it will be important to differentiate different soil characteristics during rehabilitation in order to separate soil types. The correct soil types must be replaced in the areas from which they were originally removed. This is important as it relates to rehabilitated plants which may only grow in specific soil types. A horticultural specialist must be appointed to oversee this task.
- A strict monitoring plan must be implemented to prevent the additional spread and the continued removal of alien species such as Black Wattle (*Acacia mearnsii*).

Operational Phase

- The Contractor will be responsible for the removal of alien vegetation within the boundaries of the wind energy facility disturbed during construction in accordance with the appropriate methods developed by the Working for Water Programme, and advice from this organisation must be obtained. This responsibility will extend for the duration of the defects liability period.
- During operation the clearing of alien plants within the area is required to control alien

invasions. This is mandatory, according to current legislation.

7.18 Erosion Control Measures

The following areas must be regarded as being of high erosion risk:

- Slopes > 20°.
- Slopes with convergent sub-surface drainage (percolines).
- Road culverts.
- Cut and fill slopes in areas of slope instability or erodible geology.

The above areas, particularly steep cut and fill slopes in soft or erodible material, will require appropriate erosion control measures (such as the use of gabions) and appropriate re-vegetation methods as listed below. Turbine foundations should be located in flat areas (5 degrees or less).

Construction Phase

- The removal of the natural vegetation cover must be avoided and where this cannot be done, minimised.
- Agricultural drainage methods must be used in fill materials to remove water that could trigger slumping.
- Perched water tables must be identified early, and adequate drainage for these trigger-points provided.
- The disturbance of the natural soil structure must be prevented and excavations planned carefully.
- The moving of heavy machinery unnecessarily into erosion-prone areas must be avoided.
- All fill material must be well compacted and, where necessary, use of geo-textile materials in the retention of soil fill areas made.
- Rainwater runoff from cut slopes must be prevented as far as possible.
- Sufficient storm water take-off points must be created in such a way that water does not reach velocities that will result in erosion.
- Storm water ditches must contain structures that will reduce velocity of run off.
- The use of vegetated swales must be investigated in less steep areas.
- Particular care must be taken to ensure that no existing infrastructure, such as water and sewerage reticulation lines, is damaged during construction activities.
- Any cut surfaces must be vegetated as soon as possible using local indigenous materials.
- Only local indigenous vegetation may be used for mulching.

Operational Phase

The various protective measures that were installed during the construction phase must be properly maintained. These include but are not limited to the following:

- Vegetation of road verges and cut faces must be inspected and maintained on a regular basis. This is particularly important on steep slopes.

7.19 Fencing of the Construction Site

Construction Phase

- Appropriate fencing must be erected around the construction site during the construction process. The clearing of vegetation for fencing shall be limited to the removal of trees and shrubs within 1m of the fence line within the construction area.
- Where possible, fence lines must be aligned to retain indigenous trees or tree groups. Grass or topsoil may not be removed within the cleared area alongside the fence except for rehabilitation purposes.
- Any existing fences damaged during construction activities must be repaired immediately. The following must be adhered to:
 - The Contractor must ensure that all identified highly sensitive habitats are protected by

demarcated No-Go areas via fencing or other appropriate measures. Particular attention is required to areas of sensitive Rocky Fynbos, Thicket and Thicket Mosaic to avoid damage or destruction during construction.

- In areas which need fencing the fences should have enough space between wires for small animals to move freely through them.

7.20 Pedestrian and Traffic Safety

Construction Phase

- As mentioned in Section 7.17 above, the site must be fenced off during construction to prevent unauthorised access.
- Fencing must be inspected weekly and properly maintained by the Contractor, until construction is complete.
- The Contractor must ensure that signage, which should be pictorial and in the vernacular, is erected on all boundary fences warning against unauthorised entry onto the construction area.
- Public awareness programmes must be developed by the Contractor, in consultation with the local communities, to identify areas of particular risk and approaches to reduce risk.
- Traffic calming and speed control measures for access to construction sites must be developed and implemented in consultation with the local traffic authorities.

7.21 Health Risks and Traffic generated Pollutants

Construction Phase

- During construction all vehicles and construction machinery must be maintained to a standard that minimises pollutants.

Operation Phase

- Levels of air pollution must be regularly monitored;

7.22 Access Requirements

Construction Phase

No access/haul roads other than those required for construction purposes may be developed. As far as possible, existing roads must be used for access/haulage purposes. All new temporary access/haul roads as approved by DEA must also be approved by the Contractor in consultation with the ESO and ECO. Prior to the construction of new access/haul roads, topsoil must be stripped and stockpiled as discussed under Section 7.8 above. All temporary roads no longer required must be decommissioned and the land rehabilitated as described in Section 7.3.

Operational Phase

All access requirements must be identified and detailed by the Contractor. Communities, landowners and/or developers within the turbine site will be required to apply for access to the turbine sites from the project operator, who must consider each application and consult with each applicant in this regard.

7.23 Landscape and Visual

- The Contractor must ensure that construction camps are located as inconspicuously as possible in the landscape to reduce the severity of visual impacts. This will include placing construction camps in already disturbed landscapes in close proximity to the construction area. In addition, construction camps must be temporary structures that can be moved easily, and may not be placed on ridges, elevated slopes and open landscapes.
- The Contractor must ensure that construction activities are expedited in the construction phase to reduce the time of visual exposure.
- The Contractor must place construction camps, stock piles and associated activities within the construction site or on previously disturbed sites wherever possible to reduce extensive

landscape impacts that can lead to a general degradation of the overall landscape character.

- The Contractor must ensure that construction camp establishment avoids landscape modifications such as tree cutting, grading and levelling of the landscape.
- The Contractor must write design and placement guidelines for structures and infrastructure such as signage, communication and lighting, for approval by the ECO. These must consider:
 - Use of appropriate materials;
 - Clustering of signage (massing) where possible;
- The Contractor must ensure the establishment of appropriate setbacks/buffers from adjacent sensitive land uses, especially residential and tourism;
- The Contractor, with the approval of the engineer, must ensure that building structures have modest scale, height and simple rectangular form;
- The Contractor, with the approval of the engineer, must ensure that structures are as 'transparent' as possible to 'melt' / integrate into the landscape - make use of slender structures;
- Signage and other infrastructure, must be kept to a minimum;
- New road construction must be minimised and existing roads used where possible.
- The Contractor must maintain good housekeeping on site to avoid litter and minimise waste.
- Clearance of indigenous vegetation must be minimised and rehabilitation of cleared areas must start as soon as possible.
- Erosion risks must be assessed and minimised, as erosion scarring can create areas of strong contrast which can be seen from long distances.
- Laydown areas and stockyards must be located in low visibility areas, such as valleys between the ridges (concomitant with the requirement to avoid disturbances in sensitive areas), and existing vegetation should be used to screen them from view.
- Night lighting of the construction sites must be minimised within requirements of safety and efficiency.
- Fires and fire hazards must be managed appropriately.
- Turbines must be properly maintained to avoid unnecessary downtime. A turning rotor is perceived as being useful, but if a rotor is stationary when the wind is blowing it may be seen as not fulfilling its purpose and a negative impression is created.
- Signs near wind turbines should be avoided unless they serve to inform the public about wind turbines and their function. No advertising billboards will be allowed.
- According to the Aviation Act, 1962, Thirteenth Amendment of the Civil Aviation Regulations, 1997: *"Wind turbines shall be painted bright white to provide maximum daytime conspicuousness. The colours grey, blue and darker shades of white should be avoided altogether. If such colours are to be used, then wind turbines shall be supplemented with daytime lighting, as required."*
- Lighting should be designed to minimise light pollution without compromising safety. Investigate using motion sensitive lights for security lighting. Turbines are to be lit according to Civil Aviation Authority regulations.
- Trees are an effective measure against shadow flicker and if residents are willing, trees can be planted to reduce flickering.

7.24 Accommodation of Traffic

Adequate traffic accommodation must be implemented during transportation of turbine components to the site. All relevant road traffic and other legislation must be adhered to when transporting abnormal loads to the site. The Contractor must ensure that all construction personnel and vehicles are clearly visible. The safety of both workers on site and road users must be safeguarded at all times.

7.25 Employment

Without compromising construction and operation activities and schedules, local labour must be employed as far as possible. Those successful in obtaining employment should be provided with the appropriate skills development and training.

7.25.1. Local Labour Recruitment and Employment Strategy

A facilitation strategy has been developed to provide a framework for the Contractor and Plan 8 to effectively facilitate the implementation of the Plan 8 Grahamstown Wind Project in a manner that creates opportunities for the intended beneficiaries to be actively involved in the project. The strategy to be adopted must be in line with and guided by the objectives and policies of National Government.

The social dynamics of the surrounding community must be taken into consideration in the formulation of a facilitation strategy. For example, in an area where the traditional authorities are dominant, the strategy should be to influence them to engage other community structures. This should be done in a manner that assures them that their authority is not eroded, whilst not marginalising the rest of the community.

The project must involve all the communities in the vicinity of the Plan 8 Grahamstown Wind Energy Project to ensure full participation in the project. The facilitation of employment in the areas must be done in consultation with their traditional authorities (if any), Ward Committees, Councillors, Municipalities and other development committees in the area.

Typically, this approach will involve the following steps:

- **Step One: Appointment of a Co-ordinating Social Facilitator**
The Co-ordinating Social Facilitator (CSF) will be responsible for all the social components of the project, including the setting up of Project Steering Committees (PSC) and the ground rule for the rest of the other structures and systems that will be required for the project. The CSF will manage and monitor the work of the various PSCs and oversee the recruitment, appointment and training of the Community Liaison Officers (CLO).
- **Step Two: Establishment of Project Steering Committees and Labour and Employment Desks:**
The PSC will essentially be the link between the Project Team and the Local Community. The PSC, together with the CSF and the CLO will be responsible for the development of a labour pool. It is with this labour pool where local labour will be recruited. The PSC through a labour desk will be intricately involved in the recruitment process and will monitor the performance of local labourers.
- **Step Three: Appointment of Community Liaison Officers:**
The CLO will be on the ground and basically do the day-to-day and week-to-week monitoring of labour in conjunction with the site agent and the Contractor. Both the PSC and the CLO will be responsible, answerable and accountable to the CSF.

7.26 Socio-economic considerations

Interviews with stakeholders were originally conducted in 2013 and were repeated in 2018 for the purpose of the proposed amendments. Where possible the original stakeholders contacted in 2013 were contacted again in 2018 in order to determine if changes had occurred in land use in the area.

The policy and legislative landscape has changed since 2013. This is largely as a result of the perceived acceptance of renewable energy by the country, as well as a greater awareness of climate change and the dangers it poses. The new policies included in the 2018 updated SEIA and to be reviewed below are:

- Renewable Energy Vision 2030 South Africa (2014)
- Integrated Energy Plan (2016)
- Renewable Energy Independent Power Producer Procurement Programme (REI4P)
- The Eastern Cape Provincial Economic Development Strategy (PEDS) (2017)
- Sarah Baartman District IDP (2017)

The socio-economic landscape of the study area has not changed significantly since 2013. Issues that were prevalent in 2013 such as poverty, lack of skills and education are still significant factors

that define the socio-economic context of the study area. The following section contains updated socio-economic data for Makana Local and Sarah Baartman District municipalities and compares 2011 Census data figures to 2017 datasets where appropriate. Reference is made to the sources of data within the chapter below.

In comparison to the 2013 survey results, despite the slight decrease in the number of surveyed farm owners, there has been a general reduction in the number of temporary farm workers especially in the hunting/tourism industry and crop farming industry. There has however, been a drastic increase in the number of permanent staff employed by these operations. Overall there was a ratio of 10,4 staff per farm owner in 2013, whilst in 2018 there has been found to be a ratio of 10,5, indicating that while the permanent/temporary dynamic has changed dramatically, the overall number of staff per farmer has remained the same over this period.

A limited number of the assumptions have changed between 2013 and 2018 versions of this report. The changes that have occurred are the total MW produced at the facility which has increased from 66MW to 99MW largely as a result of the larger rotor technology to be employed. Other changes include:

- The date of the commencement of construction from 2015 to 2019,
- Increase in local spend during construction from R715 million (inflation adjusted to 2018 values) in 2013 to R952 million in 2018.
- Increase in labour required during construction from 142 to 307 Full Time Equivalent (FTE) positions
- The date of the commencement of operation from 2015 to 2022,
- Increase in local spend during operation from R7.6 million (inflation adjusted to 2018 values) in 2013 to R9.4 million in 2018.

The remaining assumptions such as number of persons to be employed during operations will remain as in the previous (2013) assumptions.

A number of changes have occurred between 2013 and 2018 versions of this report. The 2018 version of this report now recognises that the renewable energy landscape has drastically changed from 2013 when WEFs were uncommon in the Eastern Cape compared to 2018, where a large number of WEFs have subsequently been developed and are now fully operational. The report also acknowledges that the Waainek WEF is also operating in the area. The presence of such a development will likely have changed perceptions towards WEFs and the renewable energy sector in the area. It is likely that fears over the presence of WEFs have been reduced as residents become more familiar with the changes in their surroundings. This is in keeping with academic literature which indicates that opposition to WEFs generally decreases after construction is completed largely as a result of a greater understanding of the nature of the WEFs. This has led to an adjustment in the sensitivity values that tourists and locals would experience.

Due to the nature of the proposed amendments, no changes to the impact tables are expected to have occurred between 2013 and 2018. The increase in value of the local spend for construction and operation as well as the new technology will not fundamentally change the impacts presented below especially with regards to magnitude, extent, duration or probability.

The potential losses to the local game farm/hunting, tourism and associated industries due to the construction of the WEF could range between R 0.1 million and R 3.9 million per annum for domestic tourists and R 0.5 million and R 6.8 million for international tourists in 2018 prices. (The combined total potential losses were estimated in 2013 to be between R 1.3 million and R 8.3 million, inflation adjusted to 2018 figures.)

Construction phase

Impact: Temporary stimulation of the national and local economy

The most significant change to the development has been that of increased spend on the development. This is especially relevant for the local content aspect. It is likely that the project will inject a larger investment into the local economy than originally anticipated due to the amended development concept. It is also likely that the induced and indirect economic benefits will increase accordingly. This increase however, will not change the overall extent, duration, type or probability of the impact. These remain unchanged when compared to the 2013 SEIA.

Mitigation

- The developer should be encouraged by the EPC contractor to increase the local procurement practices and promote the employment of people from local communities, as far as feasible, to maximise the benefits to the local economies.
- The developer should engage with local authorities and business organisations to investigate the possibility of procuring construction materials, goods and products from local suppliers where feasible.

Impact: Temporary increase in employment in the national and local economies

The proposed amendments to the facility will likely create more Full Time Equivalent (FTE) positions during construction for the local population indicating a larger positive impact on the employment levels in the area. This increase however, will not change the overall extent, duration, type or probability of the impact. These remain unchanged when compared to the 2013 assessment.

Mitigation

- Organise local community meetings to advise the local labour force about the project that is planned to be established and the employment that can potentially be applied for
- Establish a local skills desk (in Grahamstown) to determine the potential skills that could be sourced in the area
- Recruit local labour as far as feasible
- Employ labour-intensive methods in construction where feasible
- Sub-contract to local construction companies particularly SMMEs and BBBEE compliant enterprises where possible
- Use local suppliers where feasible and arrange with the local SMMEs to provide transport, catering and other services to the construction crews.

Impact: Contribution to skills development in the country and local economy

Mitigation

- Facilitate knowledge and skills transfer between foreign technical experts and South African professionals during the pre-establishment and construction phases
- Set up apprenticeship programmes to build onto existing skill levels or develop new skills amongst construction workers especially those from local communities

Impact: Temporary increase in household earnings

The proposed amendments to the facility will likely increase the earnings during construction for those directly employed to construct the facility, as compared to the 2013 SEIA forecasts. This increase, however, will not change the overall extent, duration, type or probability of the impact. These remain unchanged when compared to the 2013 assessment.

Mitigation

- Recruit local labour as far as feasible to increase the benefits to the local households
- Employ labour intensive methods in construction where feasible
- Sub-contract to local construction companies where possible
- Use local suppliers where feasible and arrange with local SMMEs and BBBEE compliant enterprises to provide transport, catering and other services to the construction crews

Impact: Temporary increase in government revenue

Mitigation

None.

Impact: Negative changes to the sense of place

Mitigation

- The mitigation measures proposed by the visual and noise specialists should be adhered to
- Natural areas that are not affected by the footprint should remain as such. Efforts should also

be made to avoid disturbing such sites during construction

Impact: Negative impact on the local tourism, game industry and associated industries

Mitigation

- Mitigation measures proposed by the visual specialists should be implemented during the beginning of the construction period to screen off visual disturbances as soon into the development phase as feasible
- Heavy vehicles travelling on secondary roads should adhere to low speed limits to minimise noise and dust pollution
- If feasible, no construction activities should be carried out during weekends and outside day time working hours

Impact: Temporary increase in social conflicts associated with the influx of people

While the updated development concept will increase the number of employees on the site as compared to the 2013 forecasts, it is unlikely that the increase will be significant enough to change the overall extent, magnitude and probability of this impact.

Mitigation

- Adhere to strict labour recruitment practices that would reduce the desire of potential employment seekers to loiter around the properties in the hope of finding temporary employment.
- Control the movement of workers between the site and areas of residence to minimise loitering around the facility. This should be achieved through the provision of scheduled transportation services between the construction site and area of residence.
- Employ locals as far as feasible through the creation of a local skills database.
- Establish a management forum comprising key stakeholders to monitor and identify potential problems that may arise due to the influx of employment seekers to the area.
- Ensure that any damages or losses to nearby affected farms that can be linked to the conduct of construction workers are adequately reimbursed.
- Assign a dedicated person to deal with complaints and concerns of affected parties.

Impact on economic and social infrastructure

Mitigation

- Engage with local authorities and inform them of the development as well as discuss with them their ability to meet the additional demands on social and basic services created by the in-migration of workers.
- Where feasible, assist the municipality in ensuring that the quality of the local social and economic infrastructure does not deteriorate through the use of social responsibility allocations.

Impact on real estate dynamics and business activity in the immediately affected area

Impact on real estate dynamics

Impact on business enterprise activity

Mitigation measures

- Mitigation measures to reduce the impact on the sense of place should be implemented if possible.

Operation phase

Impact: Sustainable increase in production and GDP-R nationally and locally

The most notable updates compared between 2013 and 2018 were largely in the construction phase of the development. There is a smaller but significant change between the operational costs between the two periods. This increase, however, will not change the overall extent, duration, type or probability of the impact. These remain unchanged when compared to the 2013 assessment.

Mitigation measures

- The operator of the wind energy facility should be encouraged to, as far as possible, procure materials, goods and products required for the operation of the facility from local suppliers to increase the positive impact in the local economy.

Impact: Creation of sustainable employment positions nationally and locally

Unlike the construction phase impacts, this is unlikely to change with the proposed amendments when compared with the original report in 2013.

Mitigation measures

- Where possible, local labour should be considered for employment so as to increase the positive impact on the local economy.
- As far as possible, local small and medium enterprises should be approached to investigate the opportunities for supply inputs required for the maintenance and operation of the facility.

Impact: Skills development of permanently employed workers

Mitigation measures

- The developer should consider establishing vocational training programmes for the local labour force to promote the development of skills required by the wind energy facility and thus provide for the opportunities for these people to be employed in other similar facilities elsewhere.

Impact: Improved standards of living for the benefiting households

Mitigation measures

- Where possible, the local labour supply should be considered for employment opportunities to increase the positive impact on the area's economy.
- As far as feasible, local small and medium enterprises should be approached to investigate the opportunities for supply inputs required for the maintenance and operation of the facility.

Impact: Sustainable increase in national and local government revenue

Mitigation measures

None.

Impact: Local economic and social development benefits derived from the project's operations

Mitigation measures

- The Community Needs analysis and Assessment Report programmes and projects should be supported throughout the project's lifespan.
- This plan should constantly be refined in consultation with local authorities and local communities to identify community projects that would result in the greatest social benefits.
- These plans should be reviewed on an annual basis and, where necessary, updated.
- When identifying enterprise development initiatives, the focus should be on creating sustainable and self-sufficient enterprises.
- In devising the programmes to be implemented through the Community Trust allocations, the developer should take into account all updates to the Makana's Integrated Development Plans and Local Economic Development Strategies.

Impact: Negative changes to the sense of place

Mitigation measures

- The mitigation measures proposed by the visual and noise specialists should be adhered to.
- Natural areas that are not affected by the footprint should remain as such. Efforts should also be made to avoid disturbing such sites during construction.

Impact: Negative impact on local tourism, game farming and associated industriesMitigation measures

- It is advisable to consult owners of the game farms during the design and construction process to take into account their requests with respect to mitigation of long-term visual disturbances and come up with practical solutions that would be acceptable to both parties.
- The mitigation measures proposed by the visual specialists should be adhered to.
- The mitigation measures proposed by the noise specialists should be adhered to.

Negative impact on the livelihoods of the household's dependant on the local tourism, game farming and associated industriesMitigation measures

- Implement all measures suggested to mitigate the impact on the sense of place.
- In the case when employees of nearby farms are retrenched and a strong causal link can be established between the retrenchments and the project activities, the developer should assist the retrenched workers to find alternative employment by either recruiting them to work at the facility or assisting them through the enterprise development programme and/or social development funding allocations prescribed by government.
- In order to avoid exerting a negative impact on the families dependent on local game farms and any other household that could be effected by the project, the developer should seek to partner with the various game farms to support affect families and ensure that the aid given to them is retained.

Table 7.1: Specific mitigation measures identified in the EIA that should be adhered to.

Study	Phase	Impact	Mitigation Measures
Avifauna	Operation	Bird collision & electrocution on overhead power lines, Impact on Red Listed and other species	Bury all 'on site' power line underground. On power lines to grid, mark certain sections of the line with anti-collision marking devices on the earth wire to increase the visibility of the line and reduce likelihood of collisions. High risk sections of line can only be identified once the route of the power lines is available. Bird friendly pole/pylon designs should be used to prevent electrocutions.
		Bird disturbance and displacement from area as result of wind turbines and other infrastructure	It is very difficult to mitigate this. Disturbance can be reduced to some extent by following general environmental best practice in terms of managing people, machines and equipment during operations and maintenance. Pre-construction monitoring has identified areas that should be excluded from development due to identified sensitivities.
		Bird collision with turbine blades	This is extremely difficult to mitigate post construction. Sensitivity mapping based on pre-construction monitoring has identified areas that should be excluded from development. If key species are found to collide in significant numbers post construction then mitigation options such as painting turbine blades, blade height adjustment and curtailment will need to be implemented.
	Construction	Disturbance of birds, Impact on Red Listed and other species during construction	Strict control should be maintained over all activities during construction, in particular heavy machinery and vehicle movements, and staff. It is difficult to mitigate fully for this as some disturbance is inevitable. The African Crowned Eagle nest on site has been buffered to ensure it is not disturbed.
		Destruction or alteration of bird habitat, Impact on Red Listed and other species	Strict control should be maintained over all activities during construction, in particular heavy machinery and vehicle movements, and staff. It is difficult to mitigate fully for this as some habitat destruction is inevitable. Existing roads should be used as much as possible, as well as avoiding sensitive areas identified by this study.
Noise	Construction	Potential construction noise sources	All construction operations should only occur during daylight hours if possible. No construction piling should occur at night. Piling should only occur during the day to take advantage of unstable atmospheric

Study	Phase	Impact	Mitigation Measures
			<p>conditions.</p> <p>Construction staff should receive “noise sensitivity” training.</p> <p>An ambient noise survey should be conducted during the construction phase.</p> <p>The noise impact should be remodelled when the micro-siting of the turbines take place.</p>
	Operation	Predicted noise levels for wind turbine generators	<p>Wind Turbine Generators 15 and 17 should be moved slightly further from the main house and workers houses at Peyneskraal during the micro-siting phase.</p> <p>The noise impact from the wind turbine generators should be measured during the operational phase, to ensure that the impact is within the recommended rating limits.</p>
Agriculture	Operation	Possible change of use of agricultural land	No mitigation required as grazing can continue on the land unimpeded. Department of Agriculture, Forestry and Fisheries has been informed of the project, and has had an opportunity to comment on the turbine and infrastructure layout.
	Construction	Loss of vegetation	Permits may be required for the removal and transplanting of listed, protected species. A plant “search and rescue” operation should be conducted prior to construction (see ecological mitigation measures).
		Pollution of water sources	<p>Construction activities adjacent to watercourses should not be closer than 100 m from the 1-in-100 year flood levels.</p> <p>Turbines should be sited at least 100 m away from earth dams and boreholes.</p> <p>Access roads must be provided with adequate drainage structures to control run-off water.</p> <p>A routine maintenance regime should be implemented as part of the operational plan for the lifespan of the project.</p>
		Erosion and construction on land with a gradient	A construction regime should be specified by the design engineer to limit and control loss of vegetation and resultant increased run-off of storm water.
Ecological	Construction	Loss of Degraded Thicket	<p>Keep removal of vegetation to a minimum.</p> <p>Set aside part of the project area for conservation. Do not remove vegetation in areas set aside for conservation.</p>
		Loss of Fynbos	<p>Keep removal of vegetation to a minimum.</p> <p>Set aside part of the project area for conservation. Do not remove vegetation in areas set aside for conservation.</p>
		Loss of Fynbos, thicket, karoo mosaic	<p>Keep removal of vegetation to a minimum.</p> <p>Set aside part of the project area for conservation. Do not remove vegetation in areas set aside for conservation.</p>
		Loss of Thicket Mosaic	<p>Keep removal of vegetation to a minimum.</p> <p>Set aside part of the project area for conservation. Do not remove vegetation in areas set aside for conservation.</p>
		Loss of plant species of special concern	Areas containing species of special concern should be noted and every effort made to reduce the impacts of construction on these sections of vegetation. SSC in any area to be cleared should be identified and rescued. Some SSC will not transplant. These individuals should, as far as possible, be left untouched.
		Loss of animal species of special concern	If any fencing is to be done; the fences should have enough space between wires for small animals to move across them uninhibited. Workers should also be educated on conservation and should not be allowed to trap animals on site.
		Loss of biodiversity	An area within the site that can be set aside for conservation and actively managed as a corridor area would be ideal to mitigate loss of biodiversity. It is recommended that as much as possible of the high sensitivity areas be set aside as conservation areas and be managed as such by the land owners and wind farm developers.
		Disruption of ecosystem function and process	Fragmentation is unlikely to occur due to the nature of the development. However, it is important to make sure all fences have wide enough mesh to let small animals through, and that large areas of vegetation are not cleared, especially for roads

Study	Phase	Impact	Mitigation Measures
		Invasion of alien species	<p>Removal of existing alien species should be consistently done.</p> <p>Rehabilitation of disturbed areas after the construction of the wind energy facility should be done as soon as possible after construction is completed.</p> <p>Invasive plant species are most likely to enter the site carried in the form of seeds by construction vehicles and staff; these should be cleaned before entering the site to prevent alien infestation.</p>
	Operation	Invasion of alien species	<p>Removal of existing alien species should be consistently done.</p> <p>Invasive plant species are most likely to enter the site carried in the form of seeds by vehicles and staff; these should be cleaned before entering the site to prevent alien infestation.</p>
Visual	Operation	Introducing highly visible wind turbines into a rural-agricultural landscape	<p>There are no mitigation measures that can reduce the perception of a negative impact significantly unless the site is avoided. But there are a number of measures that can enhance the positive aspects of the impact. It has been shown that uncluttered sites are preferred for wind farms (Gipe, 1995; Stanton, 1996; Vissering, 2005). In view of this the following mitigation measures and suggestions may enhance the positive visual aspects of the development:</p> <ul style="list-style-type: none"> • Ensure that there are no wind turbines closer than 500m to a residence or farm building. • Maintenance of the turbines is important. A spinning rotor is perceived as being useful. If a rotor is stationary when the wind is blowing it is seen as not fulfilling its purpose and a negative impression is created (Gipe, 1995). • Signs near wind turbines should be avoided unless they serve to inform the public about wind turbines and their function. Advertising billboards should be avoided. • According to the Aviation Act, 1962, Thirteenth Amendment of the Civil Aviation Regulations, 1997: "Wind turbines shall be painted bright white to provide maximum daytime conspicuousness. The colours grey, blue and darker shades of white should be avoided altogether. If such colours have been used, the wind turbines shall be supplemented with daytime lighting, as required." • Lighting should be designed to minimise light pollution without compromising safety. Investigate using motion sensitive lights for security lighting. Turbines are to be lit according to Civil Aviation regulations. • An information kiosk (provided that the kiosk and parking area is located in a low visibility area) and trails along the wind farm can enhance the project by educating the public about the need and benefits of wind power. 'Engaging school groups can also assist the wind farm proponent, as energy education is paramount in developing good public relations over the long term. Instilling the concept of sustainability, and creating awareness of the need for wind farm developments, is an important process that can engage the entire community' (Johnston, 2001).
		Shadow flicker effect	<p>A number of mitigation measures can be discussed with the owner/resident of the house:</p> <ul style="list-style-type: none"> • Trees or high thicket are effective as a measure to reduce or eliminate the effect of shadow flicker. Windows where the shadow flicker effect will occur can be determined and trees can be planted such that the effect will be reduced. • Determine which turbine (or turbines) is the main cause of the potential shadow flicker effect and reposition this turbine in the final layout (without increasing the shadow flicker effect for other buildings). • Determine when the shadow flicker effect will be at its worst for the building and reduce the speed of the turbine rotor for this period. • There also exist technologies in the form of sensors which can be installed either in the room where shadow flicker is likely to occur, or on turbines which may cause shadow

Study	Phase	Impact	Mitigation Measures
			flicker (Marks 2011) which can control rotor speed to reduce the effect.
Visual	Construction	Intrusion of large and highly visible construction activity on sensitive viewers	<p>The most obvious causes of impact cannot be mitigated for since the turbines are so tall and they are to be installed on a relatively flat coastal plain which is visible from much of the surrounding landscape. The duration of the impact is short, though, and there are a number of mitigation measures that will curtail the intensity to some extent:</p> <ul style="list-style-type: none"> • Construction of new roads should be minimised and existing roads should be used where possible. • The contractor should maintain good housekeeping on site to avoid litter and minimise waste. • Clearance of indigenous vegetation should be minimised and rehabilitation of cleared areas should start as soon as possible. • Erosion risks should be assessed and minimised as erosion scarring can create areas of strong visual contrast which can often be seen from long distances. • Laydown areas and stockyards should be located in low visibility areas (e.g. valleys between ridges) and existing vegetation should be used to screen them from views where possible. • Night lighting of the construction sites should be minimised within requirements of safety and efficiency. See section on lighting for more specific measures. • Fires and fire hazards need to be managed appropriately.
		Impact of night lights on existing nightscape	The aviation standards have to be followed and no mitigation measures are applicable in terms of marking the turbines. Lighting of ancillary buildings and structures should be designed to minimise light pollution without compromising safety. Motion sensitive lighting can be used for security purposes.
Archaeological Heritage	Construction and Operation	Impact on heritage resources	<p>It is recommended that;</p> <ul style="list-style-type: none"> • Surveyed areas (walk tracks) – with the exception of waypoints 1 and 34-35 – are suitable for the proposed activities, • Any areas outside the surveyed tracts might be archaeologically sensitive and therefore, placement of any activities outside the studied areas will require further archaeological investigation and assessment, • Once the final layout and placement of wind turbines and associated facilities and services are determined, an Archaeological Impact Assessment focusing on the affected areas should be undertaken, • Because shales occur in the study area the presence of fossils cannot be ruled out and therefore, a Palaeontological Impact Assessment (Desktop Study) should be conducted, and <p>It is required that;</p> <ul style="list-style-type: none"> • In the event that vegetation clearing and earthmoving activities expose archaeological materials, such activities must stop and the South African Heritage Resources Agency must be notified immediately. • If archaeological materials are exposed during vegetation clearing and/or earth moving activities, then they must be dealt with in accordance with the National Heritage Resources Act (No. 25 of 1999) and at the expense of the developer. • In the event of exposing human remains during construction, the matter will fall into the domain of the South African Heritage Resources Agency (Mrs Colette Scheermeyer) and will require a professional archaeologist to undertake mitigation if needed. <p>SAHRA recommends that:</p> <ul style="list-style-type: none"> • The two unmarked graves that occur on site must be fenced off during construction. The fence should be 5 meters from the edge of the graves.

Study	Phase	Impact	Mitigation Measures
			<ul style="list-style-type: none"> • Turbines should not be placed within 50 meters of the fence surrounding the graves. Access roads should not be placed within 20 meters of the fence surrounding the graves. • The old plough should be fenced off. If the landowner agrees it should be moved undercover or indoors to protect it from degradation. • The work force should be educated as to the archaeological significance of the rock art occurring on the site. • SAHRA or a professional should be contacted if any archaeological sites or artefacts, palaeontological fossils, graves or other heritage resources are found during construction.
Palaeontology	Construction	Destruction of fossiliferous material	<ul style="list-style-type: none"> • All excavations in rock for turbine foundations must be examined by a palaeontologist immediately after excavation and before any concrete is poured. • Excavations in rock for all access roads must be inspected by a palaeontologist for the presence of fossils prior to any further work is done to cover the exposed rock. • Excavated rock is to be retained, unused for any other purpose, on the site until such time as the palaeontologist has had an opportunity to inspect the rock for the presence of fossils. • Should any paleontologically important material be exposed, it must be sampled by a professional palaeontologist and accessioned into the collection of the Albany Museum in Grahamstown/Makhanda.
Bat	Construction	Destruction of bat foraging habitat	The footprint of the wind farm should be kept to a minimum, and areas designated as having a high sensitivity for bats be excluded from development.
		Destruction of bat roosts	Areas designated as having a high sensitivity for bats must be excluded from development.
		Buffer Zones	Turbines where the horizontal sweep of the rotor blades encroaches into the 150m buffer zone specified by the bat specialist for bat high-sensitivity areas should be micro-sited (moving turbines the length of a rotor blade or less) so that no part of a blade encroaches into the buffer zone
Bat	Operation	Bat mortalities during foraging and migration	<ul style="list-style-type: none"> ▪ Turbines should be curtailed during times when bats are active, low wind speeds at night is the best time (and when little electricity is being generated by the turbines). ▪ It is recommended that bat fatalities, and their causes at the wind farm are monitored, as there is no information available for wind farms in South Africa. More applicable mitigation measures to reduce bat fatalities (see below) can be applied when there is more information. ▪ Ultrasound broadcast can deter bats from flying into wind turbines. (Szewczak and Arnett 2007) ▪ Minimizing turbine height will help to reduce bat fatalities (Barclay <i>et al</i>, 2007). ▪ Turbine site placement around water bodies (dams) should be avoided (Brinkman <i>et al.</i>, 2006). ▪ Wind turbine operating times should be restricted during times when bat activity is high (Brinkman <i>et al.</i>, 2006). Bats are at higher risk of fatality on nights with low wind speeds (Horn <i>et al.</i>, 2008). This is to be better assessed after sonar mitigation techniques are evaluated and assessed.
Socio-economic	Construction	Temporary stimulation of the national and local economy	<ul style="list-style-type: none"> ▪ The developer should be encouraged by the EPC contractor to increase the local procurement practices and promote the employment of people from local communities, as far as feasible, to maximise the benefits to the local economies. ▪ The developer should engage with local authorities and business organisations to investigate the possibility of procuring construction materials, goods and products from local suppliers were feasible.
		Temporary increase in employment in the national and local	<ul style="list-style-type: none"> ▪ Organise local community meetings to advise the local labour force about the project that is planned to be established and the employment that can potentially applied

Study	Phase	Impact	Mitigation Measures
		economies	<ul style="list-style-type: none"> for. ▪ Establish a local skills desk (in Grahamstown) to determine the potential skills that could be sourced in the area. ▪ Recruit local labour as far as feasible. ▪ Employ labour-intensive methods in construction where feasible. ▪ Sub-contract to local construction companies particularly SMMEs and BBBEE compliant enterprises where possible. ▪ Use local suppliers where feasible and arrange with the local SMMEs to provide transport, catering and other services to the construction crews.
		Contribution to skills development in the country and local economy	<ul style="list-style-type: none"> ▪ Facilitate knowledge and skills transfer between foreign technical experts and South African professionals during the pre-establishment and construction phases. ▪ Set up apprenticeship programmes to build onto existing skill levels or develop new skills amongst construction workers especially those from local communities.
		Temporary increase in household earnings	<ul style="list-style-type: none"> ▪ Recruit local labour as far as feasible to increase the benefits to the local households. ▪ Employ labour intensive methods in construction where feasible. ▪ Sub-contract to local construction companies where possible. ▪ Use local suppliers where feasible and arrange with local SMMEs and BBBEE compliant enterprises to provide transport, catering and other services to the construction crews.
		Temporary increase in government revenue	None.
		Negative changes to the sense of place	<ul style="list-style-type: none"> ▪ The mitigation measures proposed by the visual and noise specialists should be adhered to. ▪ Natural areas that are not affected by the footprint should remain as such. Efforts should also be made to avoid disturbing such sites during construction.
		Negative impact on the local tourism, game industry and associated industries	<ul style="list-style-type: none"> ▪ Mitigation proposed by the visual specialists should be implemented during the beginning of the construction period to screen off visual disturbances as soon into the development phase as feasible. ▪ Heavy vehicles travelling on secondary roads should adhere to low speed limits to minimise noise and dust pollution. ▪ If feasible, no construction activities should be carried out during weekends and outside day time working hours.
		Temporary increase in social conflicts associated with the influx of people	<ul style="list-style-type: none"> ▪ Adhere to strict labour recruitment practices that would reduce the desire of potential employment seekers to loiter around the properties in the hope of finding temporary employment. ▪ Control the movement of workers between the site and areas of residence to minimise loitering around the facility. This should be achieved through the provision of scheduled transportation services between the construction site and area of residence. ▪ Employ locals as far as feasible through the creation of a local skills database. ▪ Establish a management forum comprising key stakeholders to monitor and identify potential problems that may arise due to the influx of employment seekers to the area. ▪ Ensure that any damages or losses to nearby affected farms that can be linked to the conduct of construction workers are adequately reimbursed. ▪ Assign a dedicated person to deal with complaints and concerns of affected parties.
		Impact on economic and social infrastructure	<ul style="list-style-type: none"> ▪ Engage with local authorities and inform them of the development as well as discuss with them their ability to meet the additional demands on social and basic services created by the in-migration of workers. ▪ Where feasible, assist the municipality in ensuring that the quality of the local social and economic infrastructure does not deteriorate through the use of social responsibility

Study	Phase	Impact	Mitigation Measures
			allocations.
		Impact on real estate dynamics and business activity in the immediately affected area	<ul style="list-style-type: none"> Mitigation measures to reduce the impact on the sense of place should also be implemented.
Socio-economic	Operation	Sustainable increase in production and GDP-R nationally and locally	<ul style="list-style-type: none"> The operator of the wind energy facility should be encouraged to, as far as possible, procure materials, goods and products required for the operation of the facility from local suppliers to increase the positive impact in the local economy.
		Creation of sustainable employment positions nationally and locally	<ul style="list-style-type: none"> Where possible, local labour should be considered for employment so as to increase the positive impact on the local economy. As far as possible, local small and medium enterprises should be approached to investigate the opportunities for supply inputs required for the maintenance and operation of the facility.
		Skills development of permanently employed workers	<ul style="list-style-type: none"> The developer should consider establishing vocational training programmes for the local labour force to promote the development of skills required by the wind energy facility and thus provide for the opportunities for these people to be employed in other similar facilities elsewhere.
		Improved standards of living for the benefiting households	<ul style="list-style-type: none"> Where possible, the local labour supply should be considered for employment opportunities to increase the positive impact on the area's economy. As far as feasible, local small and medium enterprises should be approached to investigate the opportunities for supply inputs required for the maintenance and operation of the facility.
		Sustainable increase in national and local government revenue	None
		Local economic and social development benefits derived from the project's operations	<ul style="list-style-type: none"> The Community Needs analysis and Assessment Report programmes and projects should be supported throughout the project's lifespan. This plan should constantly be refined in consultation with local authorities and local communities to identify community projects that would result in the greatest social benefits. These plans should be reviewed on an annual basis and, where necessary, updated. When identifying enterprise development initiatives, the focus should be on creating sustainable and self-sufficient enterprises. In devising the programmes to be implemented through the Community Trust allocations, the developer should take into account all updates to the Makana's Integrated Development Plans and Local Economic Development Strategies.
		Negative changes to the sense of place	<ul style="list-style-type: none"> The mitigation measures proposed by the visual and noise specialists should be adhered to. Natural areas that are not affected by the footprint should remain as such. Efforts should also be made to avoid disturbing such sites during construction.
		Negative impact on local tourism, game farming and associated industries	<ul style="list-style-type: none"> It is advisable to consult owners of the game farms during the design and construction process to take into account their requests with respect to mitigation of long term visual disturbances and come up with practical solutions that would be acceptable to both parties. The mitigation measures proposed by the visual specialists should be adhered to. The mitigation measures proposed by the noise specialists should be adhered to.
		Negative impact on the livelihoods of the household's dependant on the local tourism, game farming and association industries	<ul style="list-style-type: none"> Implement all measures suggested to mitigate the impact on the sense of place. In the case when employees of nearby farms are retrenched and a strong causal link can be established between the retrenchments and the project activities, the developer should assist the retrenched workers to find alternative

Study	Phase	Impact	Mitigation Measures
			<p>employment by either recruiting them to work at the facility or assisting them through the enterprise development programme and/or social development funding allocations prescribed by government.</p> <ul style="list-style-type: none"> ▪ In order to avoid exerting a negative impact on the families dependent on local game farms and any other household that could be effected by the project, the developer should seek to partner with the various game farms to support affect families and ensure that the aid given to them is retained.

8 CONCLUSION

Although all foreseeable actions and potential mitigation measures and management actions are contained in this document, the EMPr should be seen as a day-to-day management document. The EMPr thus sets out the environmental and social standards, which would be required to minimise the negative impacts and maximise the positive benefits of the Plan 8 Grahamstown Wind Energy Project as detailed in the EIR and specialist reports. The EMPr could thus change daily, and if managed correctly lead to a successful construction and operational phases.

Further guidance should also be taken for any conditions contained in the Environmental Authorisation, if the project is granted approval, and that these DEA conditions must be incorporated into the final EMPr.

All attempts must be made to have this EMPr available, as part of any tender documentation, so that the engineers and contractors are made aware of the potential cost and timing implications needed to fulfil the implementation of the EMPr, thus adequately costing for these.

9 REFERENCES

CES 2015a: Second Final Amended Environmental Impact Assessment Report: Proposed Plan 8 Grahamstown Wind Energy Project, Makana Municipality. Volume 3, CES, Grahamstown, April 2015.

CES 2015b: Addendum to Second Final Amended EIA Report, CES, Grahamstown, April 2015.

CES 2015c: Environmental Management Programme: Proposed Plan 8 Grahamstown Wind Energy Project, Makana Municipality, Volume 4, CES, Grahamstown, April 2015.

DEA 2015: Environmental Authorisation in terms of Regulation 36 of the Environmental Impact Assessment Regulations, 2010,: Establishment of the Plan 8 Grahamstown Wind energy Facility (WEF) and its associated infrastructure within the Makana Local Municipality, Eastern Cape, Cacadu District Municipality, Department of Environmental Affairs, 22nd October 2015.

Makana LM 2016: Makana Integrated Land Use Scheme, November 2016

SABAA 2016: Sowler *et al*, South African Good Practice Guidelines for Surveying Bats at Wind Energy Facility Developments - Pre-construction, Third Edition, South African Bat Assessment Association, September 2016.

ANNEXURE A: PROPOSED PROJECT LAYOUT IN RELATION TO SENSITIVE AREAS AND BUFFER ZONES

The EIA Regulations 2014, as amended in 2017, require the inclusion in the EMPr of a sensitivity map of the site, overlain by the proposed infrastructure layout. In this case there are eight sensitive areas defined on the site, all of which are surrounded by defined buffer zones. A consolidated map would be so cluttered that it would be of little use in identifying any violations of the sensitive areas and/or their buffer zones,

Accordingly eight separate figures are presented in this Annexure, showing the proposed locations of the turbines in relation to the sensitive areas identified by the some of the specialists, and the extent of any recommended buffer zones. The turbine locations are also shown in relation to the buffers required by Eskom for its 132kV and 22kV overhead power lines (200m) that traverse the project site, by SANRAL for the route of the N2 highway that divides the southern and northern parts of the site, and by Makana Local Municipality (Makana LM 2016) in respect of the proximity of turbines to the external boundary of the site and public road that crosses the southern part of the site.

A ninth figure shows the locations of the three heritage sensitive sites identified on the site. The turbine locations are those approved in the October 2016 Environmental Authorisation. None of the turbines are close to the sites, and micro-siting the turbines to avoid the bat high-sensitivity areas will not move any turbines significantly closer to the heritage sites.

The turbine locations are those proposed as the amended turbine layout, in which 13 of the 22 turbines remain in the locations approved in the October 2015 Environmental Authorisation. Six turbines must be micro-sited (moved by approximately the length of a turbine blade or less) to comply with the SABAA recommendation that no part of a rotor blade should encroach into the buffer zone established around an area of bat high-sensitivity. Two must be micro-sited to comply with Makana LM's external site boundary criterion, and one to comply with the public road criterion.

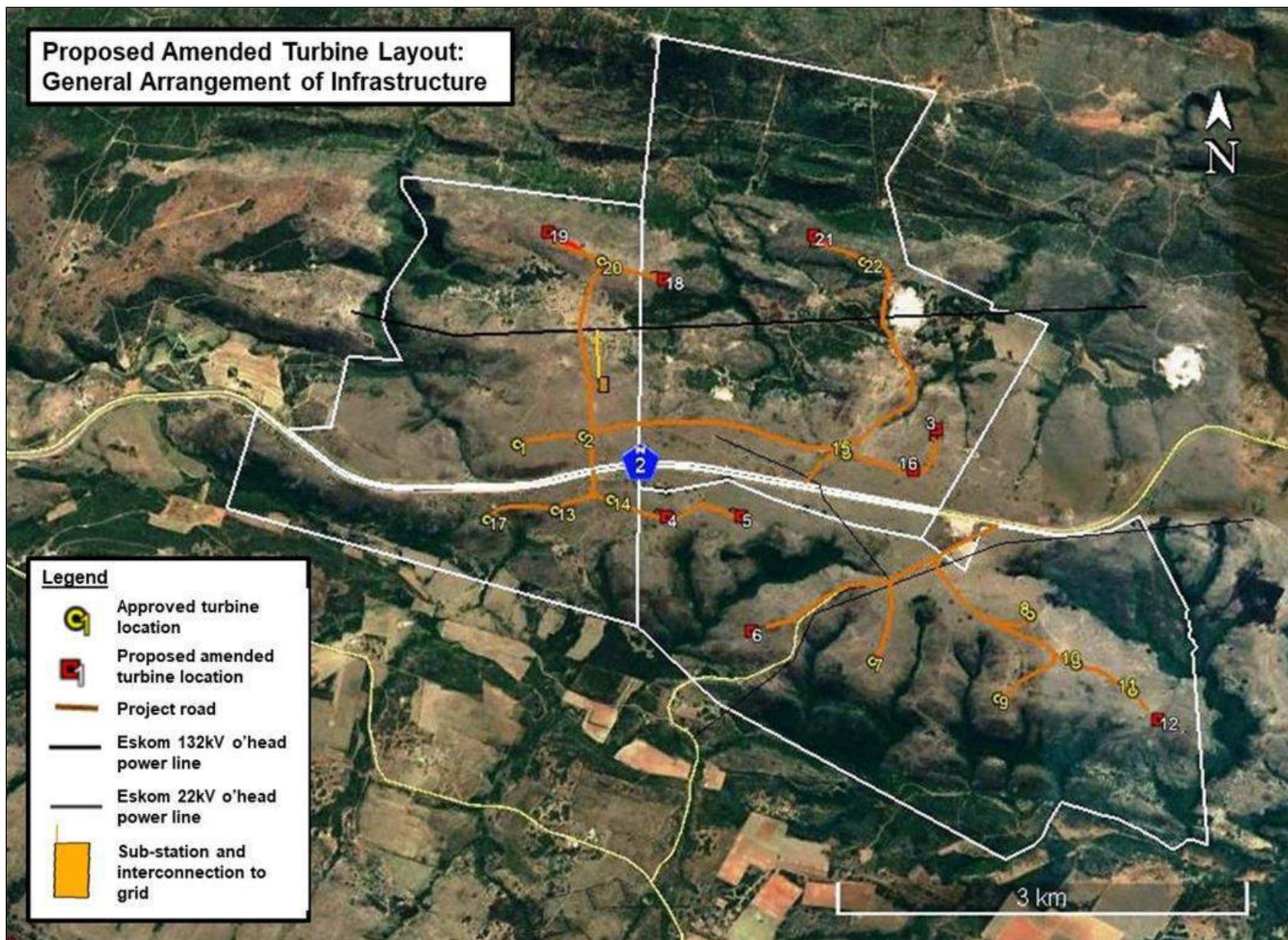


Figure A-1: Proposed amended layout of turbines, roads, substation and interconnection to the grid

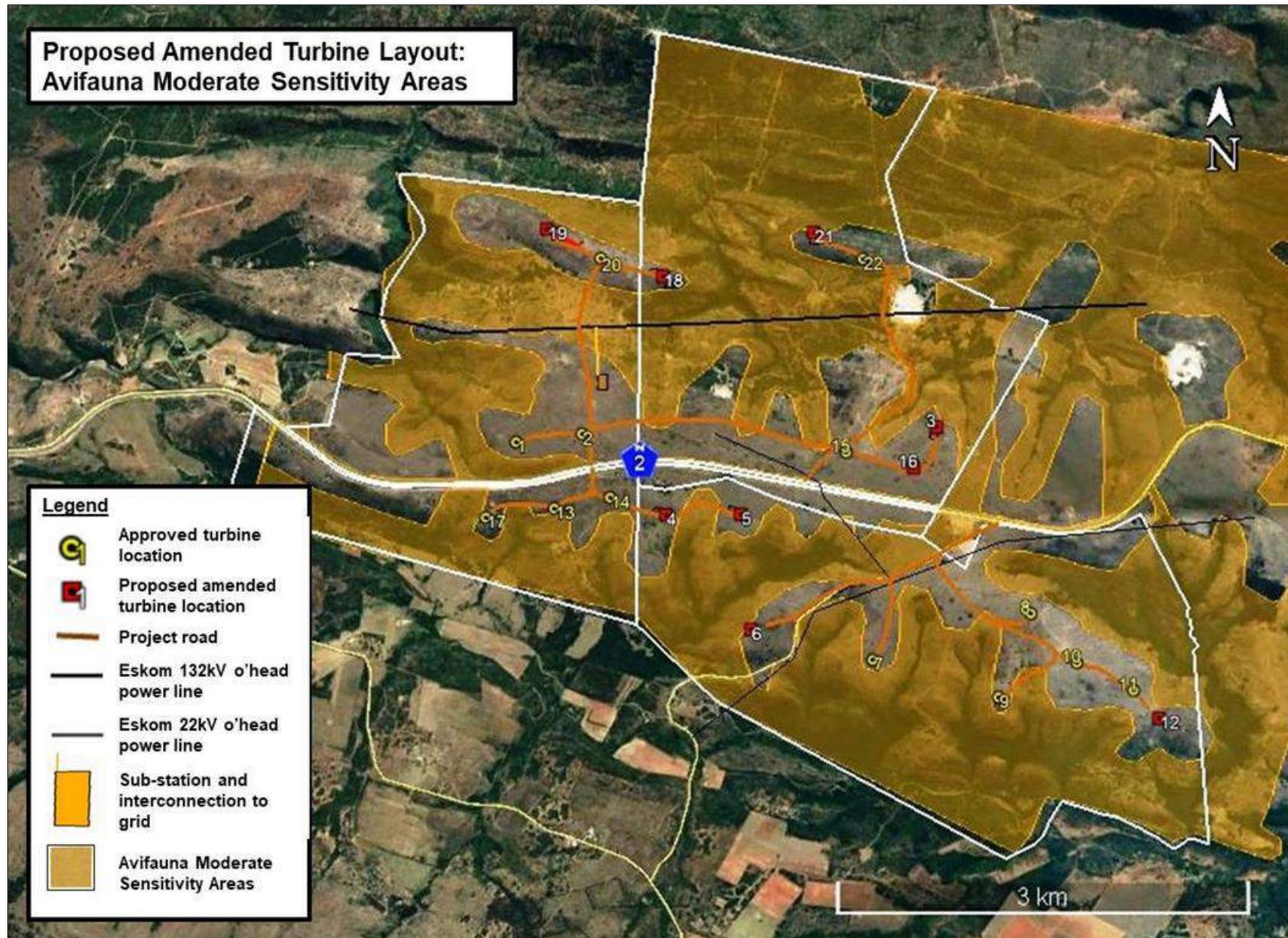


Figure A-2: Proposed amended turbine layout: Avifauna moderate-sensitivity

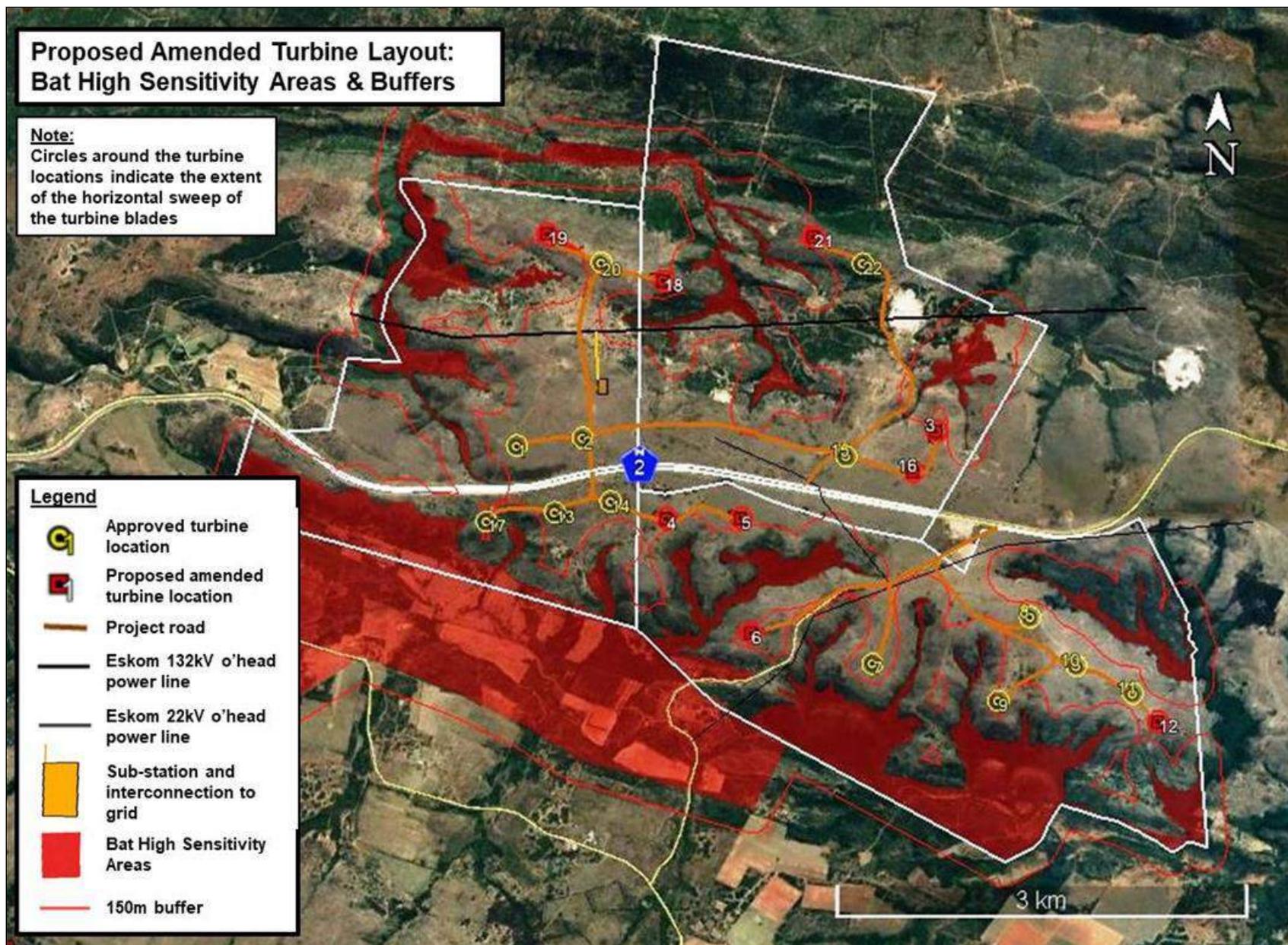


Figure A-3: Proposed Amended Turbine Layout: Bat high sensitivity areas & buffers

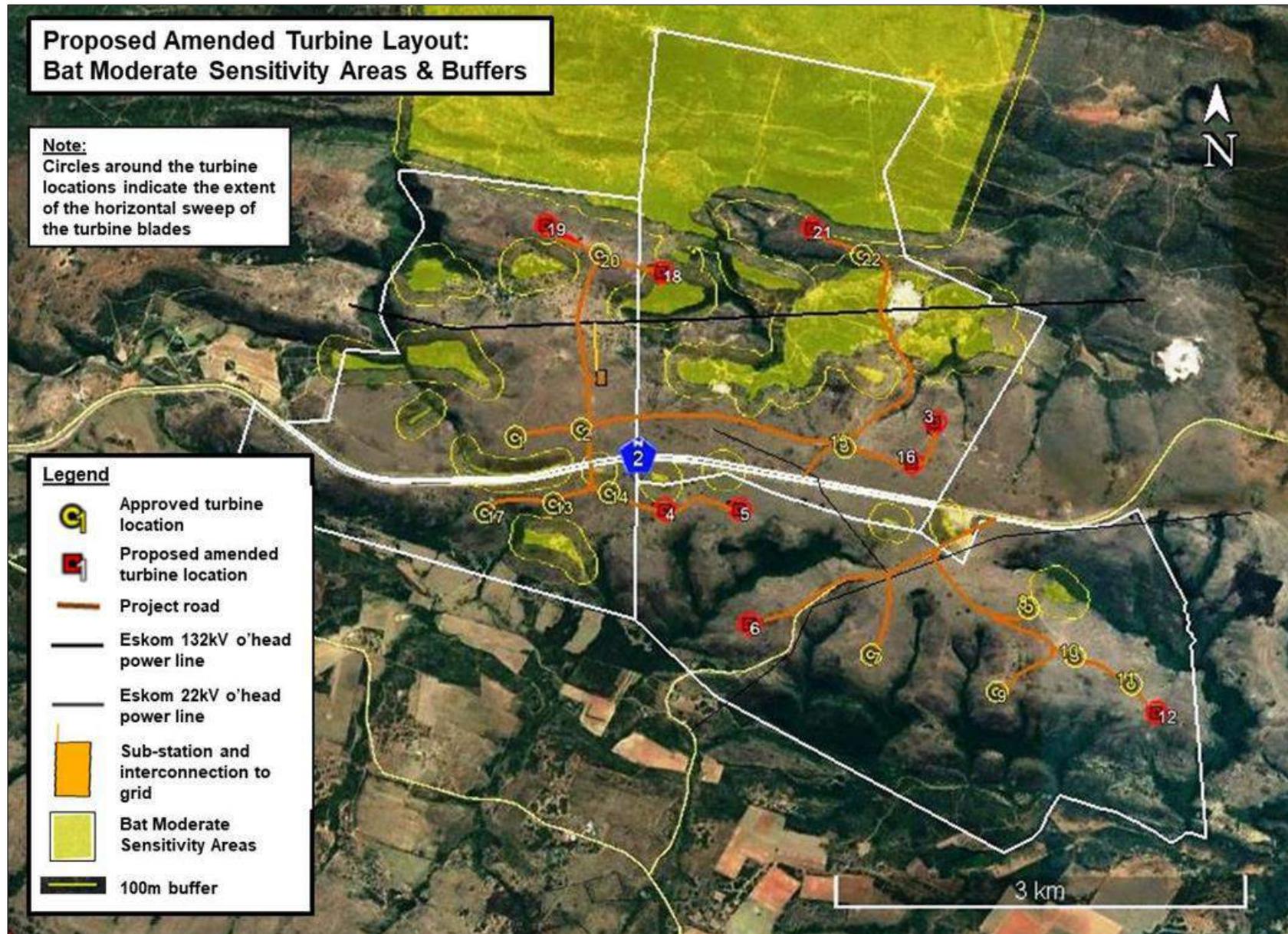


Figure A-4: Proposed Amended Turbine Layout: Bat moderate-sensitivity areas & buffers

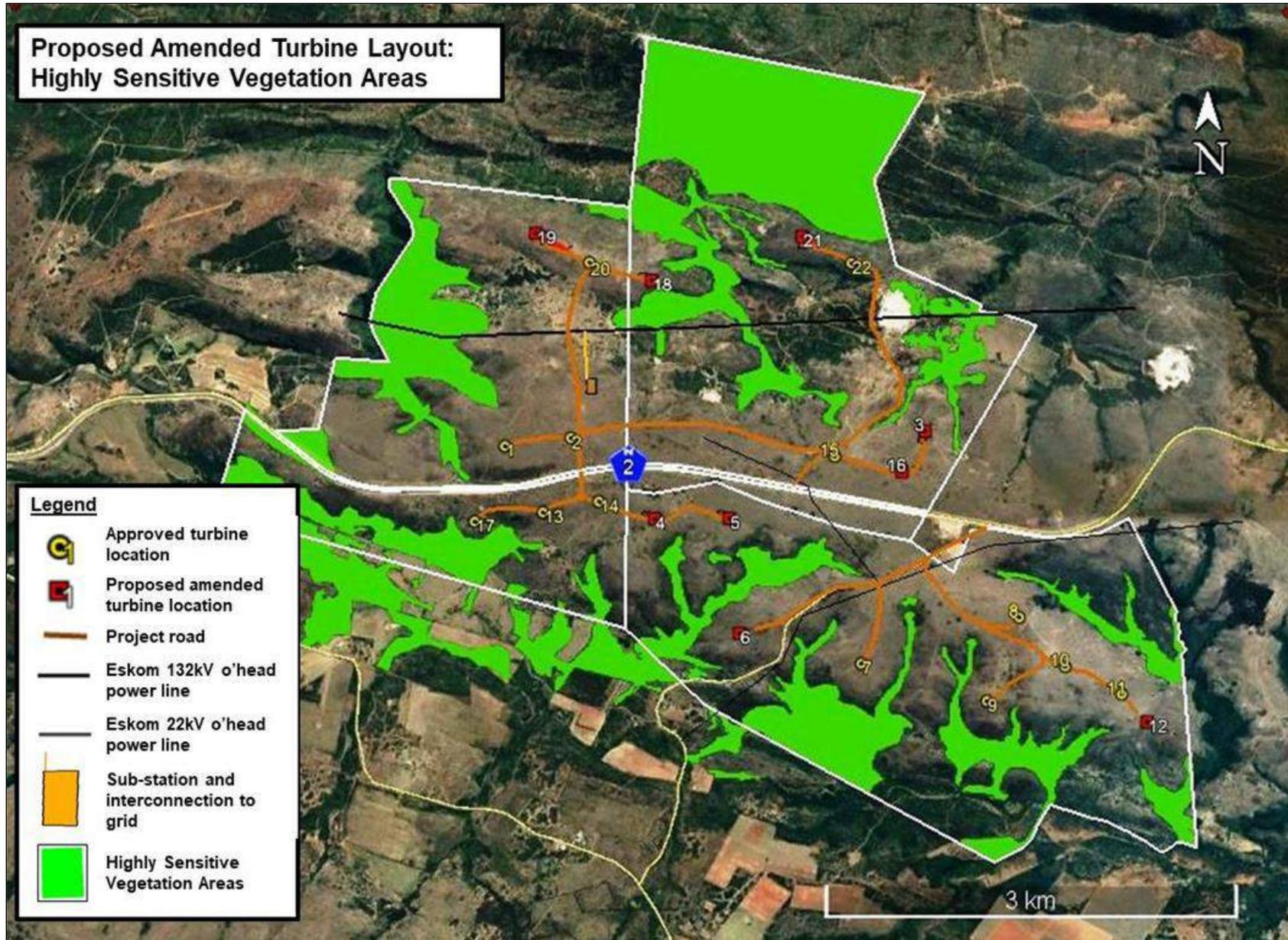


Figure A-5: Proposed Amended Turbine Layout: Vegetation high-sensitivity areas

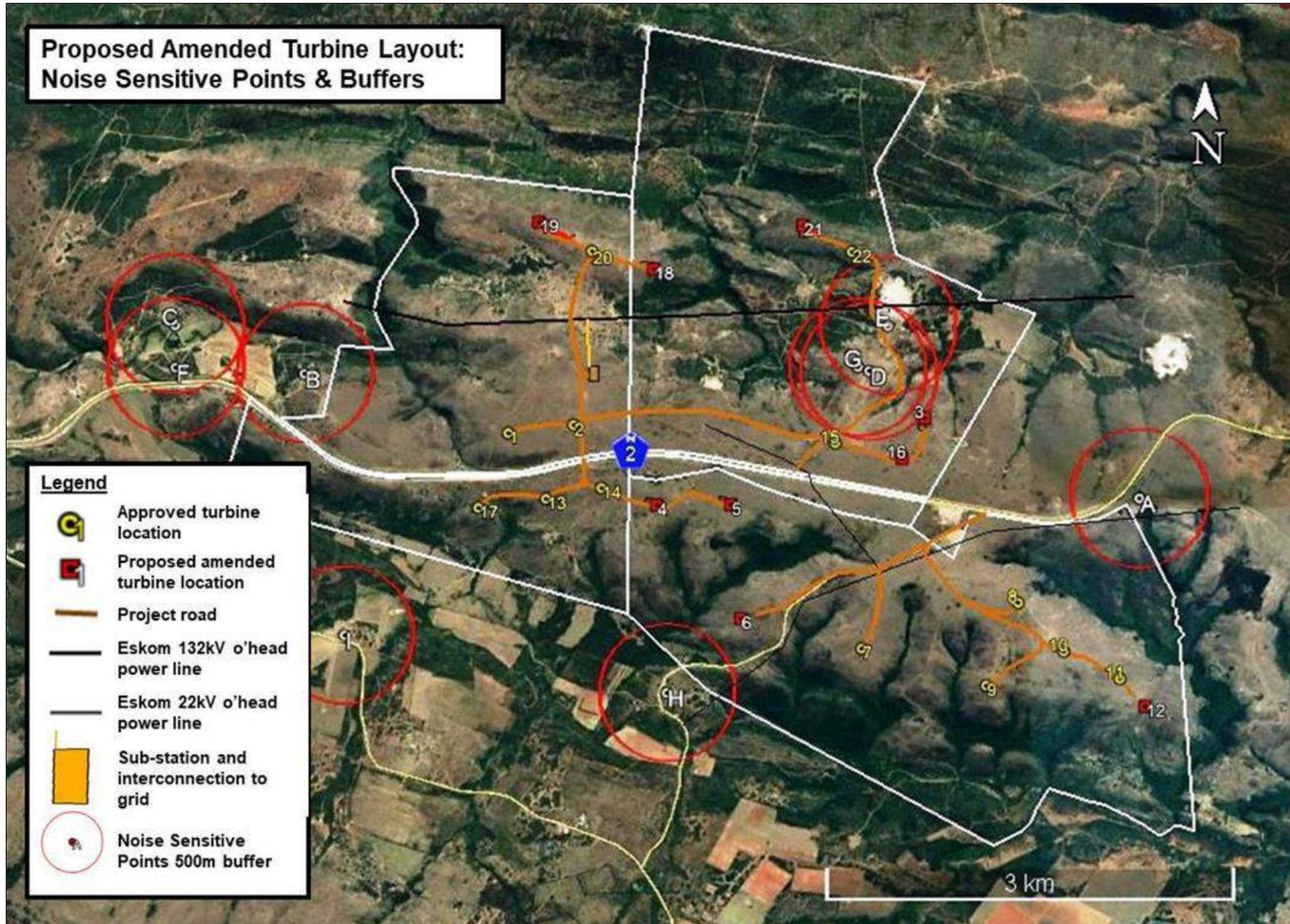


Figure A-6: Proposed Amended Turbine Layout: Noise sensitive points and buffers

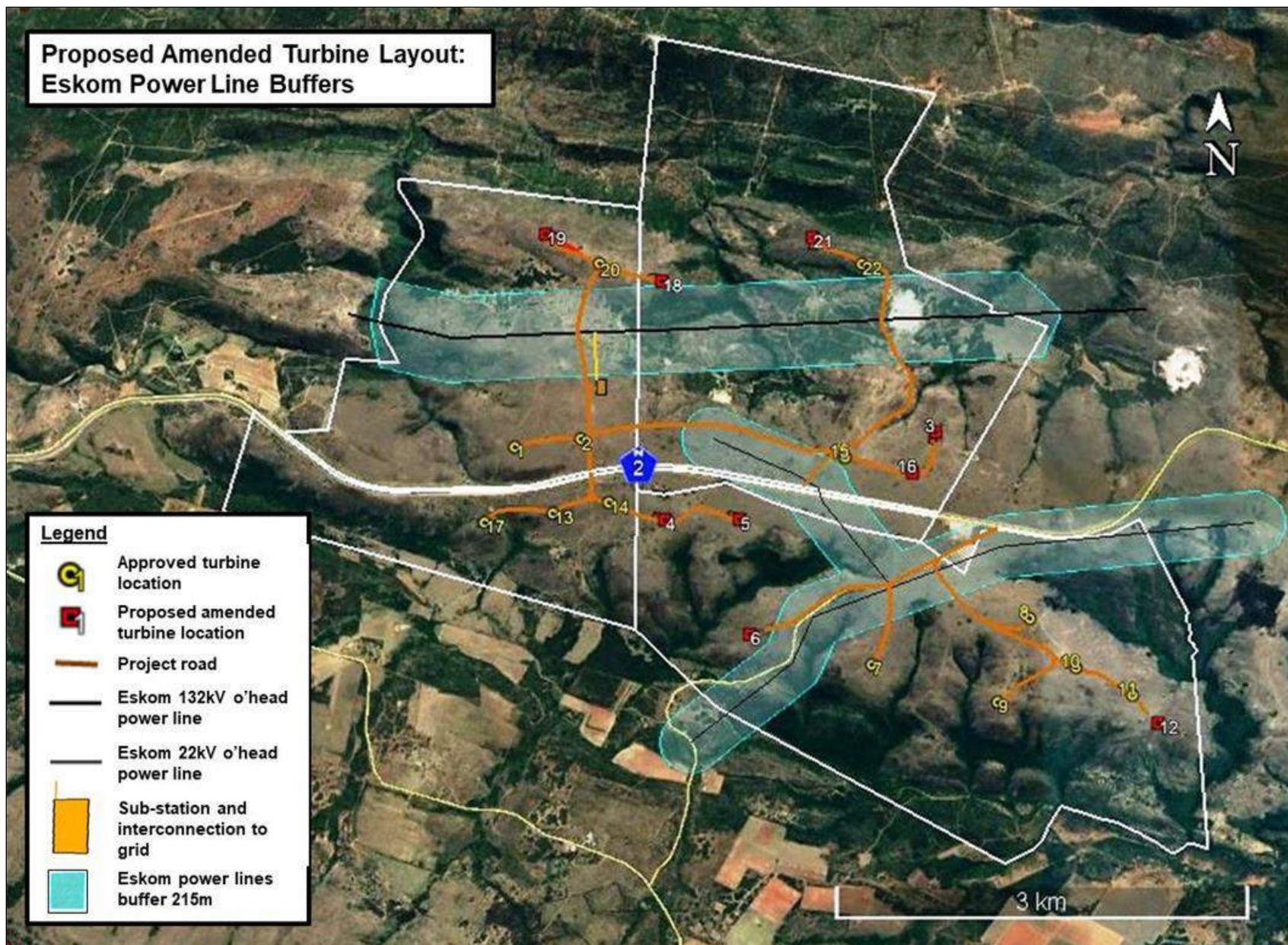


Figure A-7: Proposed Amended Turbine Layout: Eskom power line buffers

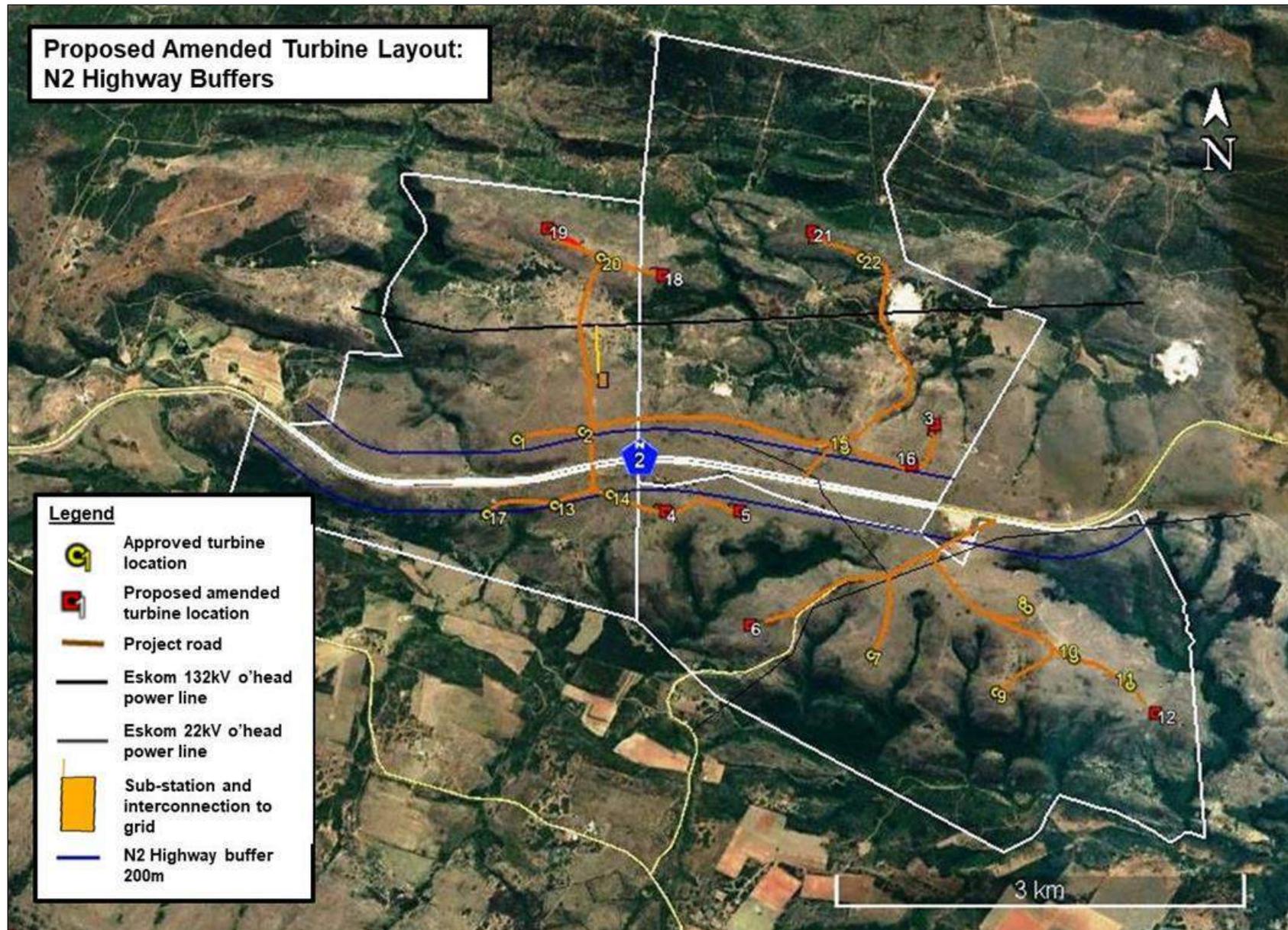


Figure A-8: Proposed Amended Turbine Layout: N2 highway buffers

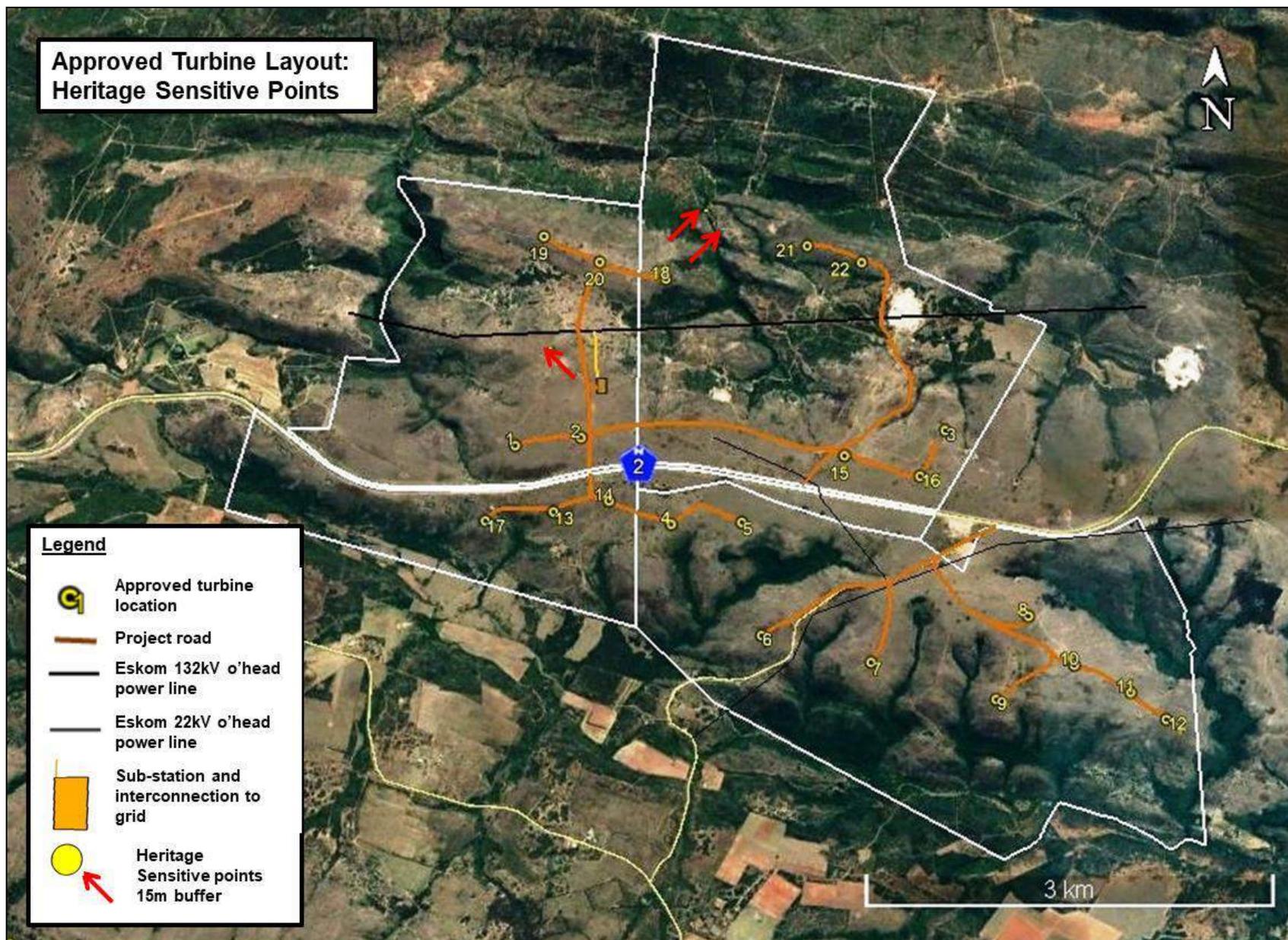


Figure A-9: Approved Turbine Layout: Heritage sensitive points

ANNEXURE B: PRO FORMA: PROTECTION OF THE ENVIRONMENT
To be signed by Contractors and Sub-contractors

PRO FORMA

Employer _____

Contract No _____

Contract title _____

PROTECTION OF THE ENVIRONMENT

The Contractor will not be given right of access to the site until this form has been signed.

I/ we _____ (Contractor) record
as follows:

1. I/ we, the undersigned, do hereby declare that I/ we am/ are aware of the increasing requirement by society that construction activities shall be carried out with due regard to their impact on the environment.
2. In view of this requirement of society and a corresponding requirement by the Employer with regard to this Contract, I/ we will, in addition to complying with the letter of the terms of the Contract dealing with protection of the environment, also take into consideration the spirit of such requirements and will, in selecting appropriate employees, plant, materials and methods of construction, in so far as I/ we have the choice, include in the analysis not only the technical and economic (both financial and with regard to time) aspects but also the impact on the environment of the options. In this regard, I/ we recognise and accept the need to abide by the "precautionary principle" which aims to ensure the protection of the environment by the adoption of the most environmentally sensitive construction approach in the face of uncertainty with regard to the environmental implications of construction.
3. I/ we acknowledge and accept the right of _____ to deduct, should they so wish, from any amounts due to me/us, such amounts (hereinafter referred to as fines) as the Resident Engineer and Environmental Site Officer shall certify as being warranted in view of my/ our failure to comply with the terms of the Contract dealing with protection of the environment, subject to the following:
 - 3.1 The Resident Engineer and Environmental Officer, in determining the amount of such fine, shall take into account *inter alia*, the nature of the offence, the seriousness of its impact on the environment, the degree of prior compliance/non-compliance, the extent of the Contractor's overall compliance with environmental protection requirements and, in particular, the extent to which he considers it necessary to impose a sanction in order to eliminate/reduce future occurrences.
 - 3.2 The Resident Engineer and Environmental Officer shall, with respect to any fine imposed, provide me/ us with a written statement giving details of the offence, the facts on which the Resident Engineer and Environmental Officer has based his assessment and the terms of the Contract (by reference to the specific clause) which has been contravened.

Signed _____
CONTRACTOR

Date _____

ANNEXURE C: PROPOSED ENVIRONMENTAL EDUCATION COURSE

WHAT IS THE ENVIRONMENT?

- Soil
- Water
- Plants
- People
- Animals
- Air we breathe
- Buildings, cars and houses



WHY MUST WE LOOK AFTER THE ENVIRONMENT?

- It affects us all as well as future generations
- We have a right to a healthy environment
- A contract has been signed
- Disciplinary action (e.g. construction could stop or fines issued)

HOW DO WE LOOK AFTER THE ENVIRONMENT?

- Report problems to your supervisor/ foreman
- Team work
- Follow the rules in the EMP



WORKING AREAS

Workers & equipment must stay inside the site boundaries at all times



RIVERS & STREAMS

- Do not swim in or drink from streams
- Do not throw oil, petrol, diesel, concrete or rubbish in the stream
- Do not work in the stream without direct instruction
- Do not damage the banks or vegetation of the stream



ANIMALS

- Do not injure or kill any animals on the site
- Ask your supervisor or Contract's Manager to remove animals found on site



TREES AND FLOWERS

- Do not damage or cut down any trees or plants without permission
- Do not pick flowers



SMOKING AND FIRE

- Put cigarette butts in a rubbish bin
- Do not smoke near gas, paints or petrol
- Do not light any fires without permission
- Know the positions of fire fighting equipment
- Report all fires
- Do not burn rubbish or vegetation without permission



PETROL, OIL AND DIESEL

- Work with petrol, oil & diesel in marked areas
- Report any petrol, oil & diesel leaks or spills to your supervisor
- Use a drip tray under vehicles & machinery
- Empty drip trays after rain & throw away where instructed



DUST

Try to avoid producing dust –
Use water to make ground & soil wet



NOISE

- Do not make loud noises around the site, especially near schools and homes
- Report or repair noisy vehicles



TOILETS

- Use the toilets provided
- Report full or leaking toilets



EATING

- Only eat in demarcated eating areas
- Never eat near a river or stream
- Put packaging & leftover food into rubbish bins



RUBBISH

- Do not litter - put all rubbish (especially cement bags) into the bins provided
- Report full bins to your supervisor
- The responsible person should empty bins regularly



TRUCKS AND DRIVING

- Always keep to the speed limit
- Drivers - check & report leaks and vehicles that belch smoke
- Ensure loads are secure & do not spill



EMERGENCY PHONE NUMBERS

Know all the emergency phone numbers:

- Ambulance:
- Fire:
- Police:



FINES AND PENALTIES

- Spot fines of between

To be confirmed by Engineer

- Your company may be fined
- Removal from site
- Construction may be stopped



PROBLEMS - WHAT TO DO!

- Report any breaks, floods, fires, leaks and injuries to your supervisor
- Ask questions!



ANNEXURE D: PRO FORMA: ENVIRONMENTAL COMPLAINTS REGISTER

ENVIRONMENTAL COMPLAINTS REGISTER							
CONTRACT TITLE:							
CONTRACT NUMBER:							
DATE	COMPLAINT	COMPLAINT MADE BY (Include Contact Details)	ACTION REQUIRED	RESPONSIBLE PERSON	ACTION IMPLEMENTED	DATE ACTION IMPLEMENTED	CHECKED BY ECO

ANNEXURE E: PRO FORMA: ENVIRONMENTAL INCIDENTS REGISTER

ENVIRONMENTAL INCIDENTS REGISTER							
CONTRACT TITLE:							
CONTRACT NUMBER:							
DATE	INCIDENT (What, where, how, possible impacts)	REPORTED BY	ACTION REQUIRED	RESPONSIBLE PERSON	ACTION IMPLEMENTED	DATE ACTION IMPLEMENTED	CHECKED BY ECO