



# **Impofu East Wind Farm and Associated Infrastructure, Oyster Bay in the Eastern Cape**

Environmental Management Programme

**Red Cap Impofu East (Pty) Ltd**

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to life*

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## Abbreviations

<b>BFDs</b>	Bird Flight Diverters
<b>CLO</b>	Community Liaison Officer
<b>DAFF</b>	Department of Agriculture, Forestry and Fisheries
<b>DEA</b>	Department of Environmental Affairs
<b>DEA&amp;DP</b>	Department of Environmental Affairs and Development Planning
<b>DEDEAT</b>	Department of Economic Development, Environmental Affairs and Tourism
<b>DWS</b>	Department of Water and Sanitation
<b>EA</b>	Environmental Authorisation
<b>EAP</b>	Environmental Assessment Practitioner
<b>ECPHRA</b>	Eastern Cape Provincial Heritage Resources Agency
<b>ECO</b>	Environmental Control Officer
<b>EIA</b>	Environmental Impact Assessment
<b>EIR</b>	Environmental Impact Report
<b>EIRF</b>	Environmental Incident Report File
<b>EMPr</b>	Environmental Management Programme
<b>ESO</b>	Environmental Site Officer
<b>HV</b>	High Voltage
<b>MSDS</b>	Material Safety Data Sheets
<b>NEMA</b>	National Environmental Management Act (Act 107 of 1998)
<b>NEM:BA</b>	National Environmental Management: Biodiversity Act (Act 10 of 2004)
<b>NHRA</b>	National Heritage Resources Act (Act 25 of 1999)
<b>NMBM</b>	Nelson Mandela Bay Metropolitan
<b>NWA</b>	National Water Act (Act 36 of 1998)
<b>OHSA</b>	Occupational Health and Safety Act (No. 85 of 1998)
<b>SAHRA</b>	South African Heritage Resources Authority

## Units of Measurement

<b>ha</b>	Hectares
<b>km</b>	kilometres
<b>Km/h</b>	Kilometre per hour
<b>kV</b>	Kilovolt
<b>m</b>	metres
<b>Mm</b>	Millimetre
<b>MW</b>	Megawatts

## Definitions and Terminology

**All staff** - The entire workforce and project team appointed by the Developer to implement the project. Sub-contractors, service or product providers / suppliers, artisans and workers employed by the Contractor, Consulting Engineers or Environmental Consultants, and persons visiting or making deliveries to the site.

**Alien species** – (a) A species (plant or animal) that is not an indigenous species; or (b) an indigenous species translocated or intended to be translocated to a place outside its natural distribution range in nature, but not an indigenous species that has extended its natural distribution range by natural means of migration or dispersal without human intervention.

**Auditing** – A systematic, documented, periodic and objective evaluation of how well the environmental management programme is performing with the aim of helping to safeguard the environment by facilitating management control of which would include meeting regulatory requirements.

**Commence** – The start of any physical activity, including site preparation and any other activity on site furtherance of a listed activity or specified activity, but does not include any activity required for the purposes of an investigation or feasibility study as long as such investigation or feasibility study does not constitute a listed activity or specified activity.

**Contaminated water** – Water contaminated by the Contractor's activities such as with hazardous substances, hydrocarbons, paints, solvents and runoff from plant, workshop or personnel wash areas but excludes water containing cement/ concrete or silt.

**Contractor's camp** - In the context of this document refers to the location and layout of any storage containers, fuel storage areas and protection bunds, material lay-down areas, hazardous chemical storage facilities, wash bays, workshops and plant service and maintenance areas, oil separators and grease traps, first aid facilities, training facilities, central waste storage areas, and any other facilities associated with the Contractor's camp (as may be applicable).

**Corrective action** – Reactive response required to address an environmental problem that is in conflict with the requirements of the EMP. The need for corrective action may be determined through monitoring, audits or management review.

**Development Sites** – Sites approved for development where construction activities specific to this project have taken, are taking or will take place and that will have an impact on the environment.

**Disciplinary action** - In the context of this document refers to financial penalties, time penalties, legal action, dismissal and/or any other action taken against the culprit responsible for an incident of non-compliance with the Environmental Management Programme. The disciplinary action will be determined according to the nature of the non-compliance or crime.

**Dust** – Any material composed of particles small enough to pass through a 1 mm screen and large enough to settle by virtue of their weight into the sampling container from the ambient air.

**Environmental Authorisation** - The authorisation of listed activities in terms of Regulations pursuant to the National Environmental Management Act, No. 107 of 1998, as amended, and issued by the National Department of Environmental Affairs.

**Environmental Impact Assessment** - Is a process that evaluates the environmental and socio-economic characteristics of proposed projects and the consequences of the project on the environment and the people that live in the area affected by the project activities. Where negative impacts are likely to result from the project, measures can be recommended to avoid or lessen these impacts to a level where the impacts are considered environmentally and socially acceptable. Where positive impacts are likely to result from the project, measures can be recommended to increase these impacts. The EIA process also provides interested and affected parties (I&APs) with an opportunity to comment on the project and to be kept informed about decisions that may affect them or the environment.

**Environmental Incident** - An accident or unexpected occurrence related to the project, including (but not limited to) runaway fires, pollution events and spills, unplanned explosions, major emissions or erosion events, or bank collapse leading to serious or potentially serious negative environmental impacts.

**Environmental Incident Report File** – A file provided for the recording of all environmental incidents and includes a Complaint Register for the recording of general public concerns.

**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 project are enhanced.

**Erosion** – The loss of soil through the action of water, wind, ice or other agents, including the subsidence of soil.

**Heritage Resource** - Any place or object of heritage significance i.e. of archaeological, palaeontological, cultural, aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance.

**Interested & Affected Parties (I&APs)** - Any individual or group of individuals concerned with, interested in, or affected by the project and its consequences, including (but not restricted to) the local community and general public, government and local authorities, stakeholders, landowners, tribal authorities and public interest groups.

**Invasive vegetation** - An undesirable alien or indigenous plant growth which shall include, but not be limited to, all declared alien invader species as set out in the regulations pursuant to the National Environmental Management: Biodiversity Act, No. 10 of 2006. Other vegetation deemed to be invasive shall be those plant species that show the potential to occupy in numbers any area within the defined construction site, and which are declared to be undesirable and are generally habitat transformers, germinating rapidly in response to disturbances and capable of out-competing desired indigenous species.

**Laydown area** – Area/s (as agreed to by the affected landowner/s) in close proximity to the development site/s that is/are utilised for the stockpiling of materials, or the storage of vehicles, equipment and plant.

**Method Statement** – A written submission setting out the plant, materials, labour and method the Contractor proposes using to carry out an activity, identified by the relevant specification or by the Project manager/Client/ECO when requesting the Method Statement, in such detail that the Project Manager/Client/ECO is enabled to assess whether the Contractor's proposal is in accordance with the Specifications/EMPr and/or will produce results in accordance with the Specifications/EMPr.

**Mitigation** – Measures designed to avoid, reduce or remedy adverse impacts.

**Monitoring** – The repetitive and continued observation, measurement and evaluation of environmental criteria to follow changes over a period of time and to assess the efficiency of control measures.

**No-Go Area** - Highly sensitive areas and their buffer zones (informed by the environmental assessment and specialist walkthrough exercise) within the construction footprint identified as areas that shall be excluded from any construction activity or general access by the construction team.

**Pollution** – Any change in the environment caused by (a) substances, (b) radioactive or other waves; or (c) 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 wellbeing 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.

**Reasonable** – Unless the context indicates otherwise, reasonable in the opinion of the relevant environmental authority or the ECO.

**Ripping** – The action of loosening of the soil to a depth of 300 mm, parallel to the contours and not more than 300mm apart.

**Scarifying** – Loosening the soil in areas which have become hard and compacted and which need to be loosened in order to facilitate revegetation.

**Subsoil** – The soil horizons between the topsoil horizon and the underlying parent rock.

**Topsoil** – The upper soil profile irrespective of the fertility appearance, structure, agriculture potential, fertility and composition of the soil, usually containing organic material and which is colour specific.

**Waste** – Any substance, material or object, that is unwanted, rejected, abandoned, discarded or disposed of, or that is intended or required to be discarded or disposed of, by the holder of that substance, material or object, whether or not such substance, material or object can be re-used, recycled or recovered and includes all wastes as defined in Schedule 3 of the National Environmental Management: Waste Act (No. 59 of 2008). There are two main types of waste as follows:

**General waste** means waste that does not pose an immediate hazard or threat to health or to the environment, and includes-

- (a) domestic waste;
- (b) building and demolition waste;
- (c) business waste; and
- (d) inert waste;

**Hazardous waste** means any waste that contains organic or inorganic elements or compounds that may, owing to the inherent physical, chemical or toxicological characteristics of that waste, have a detrimental impact on health and the environment;

**Watercourse** – (a) A river or spring, (b) a natural channel in which water flows regularly or intermittently, (c) a wetland, pan, lake or dam into which, or from which, water flows.

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# SECTION A: CONTEXT AND IMPACT SUMMARY

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# 1 OVERVIEW

## 1.1 INTRODUCTION

This life-cycle Environmental Management Programme (EMPr) has been prepared for the Impofu East Wind Farm and associated infrastructure, near Oyster Bay in the Eastern Cape (refer to Figure 1). The wind turbines on the Impofu East Wind Farm will generate electricity that will be fed into the national electricity grid. Additional ancillary infrastructure will include underground and above-ground cabling between project components, onsite substation/s, foundations to support turbine towers, hardstands to support cranes at each turbine, service and access roads, and permanent operations/maintenance buildings, office and workshop areas.

The wind farm project was the subject of an Environmental Impact Assessment (EIA) process that was undertaken in terms of the National Environmental Management Act (107 of 1998) (NEMA) Environmental Impact Assessment (EIA) Regulations GN R982 of 2014 (as amended) and submitted to the Department of Environmental Affairs (DEA) as an application for Environmental Authorisation (EA).

Red Cap Impofu East (Pty) Ltd (Red Cap) (or its successor in title), is the Proponent and holder of the EA, and will be responsible for the construction of the proposed wind farm and associated infrastructure. Once constructed, the Proponent will then be responsible for the operation and maintenance of the infrastructure as well as decommissioning, should the need arise.

This EMPr collates the various legal requirements, specific and general mitigations as well as management measures derived from the impact assessment process, together with other relevant standards and best practice, into a document to guide the Proponent and associated parties through responsible and lawful implementation of the proposed project in the most practical manner.

## 1.2 STRUCTURE OF THIS DOCUMENT

This EMPr aims to ensure that appropriate environmental management is applied throughout the project life-cycle, from planning and design, through construction, to operation and potential decommissioning. This EMPr is thus intended for use by all role players in the development of the proposed project, but most importantly will form part of the contract documentation for all Contracts pertaining to the development construction and operation of the project.

This document is presented as two sections:

- **Section A: Context & Impact Summary** provides an introductory chapter that discusses the structure of this document, as well as how to accommodate future improvements or inclusions to the EMPr, given that it is not a static document. The first chapter also provides the legal context and requirements for an EMPr. The second chapter provides the context, including a project description and a summary of the impacts identified during the environmental investigations.
- **Section B: Environmental Management Programme** provides the third chapter on the implementation of the EMPr, which describes the various role players and their responsibilities in terms of this EMPr, as well as the requirements for compliance monitoring, the Environmental Incident Report File, the Complaints Register, the Method Statements, and the staff induction and environmental training. This chapter also discusses requirements for temporary site closure and record keeping. The fourth chapter sets out the requirements for the Pre-Construction Phase including the permits, licenses and registrations required to remain legally compliant, and the right to land and access acquisition. This chapter also provides the detailed design phase considerations including environmental sensitivities and tender considerations. The fifth, sixth and seventh chapters set out the requirements for the construction phase, operational phase and decommissioning phase of the project respectively.

## 1.3 FUTURE IMPROVEMENTS AND INCLUSIONS

This EMPr is not a static document and should remain flexible to changes in project planning and implementation. This document should be seen in an iterative context allowing for amendments throughout the life-cycle of the project and allowing for adjustments as new information is made available. The intention is that improvements and inclusions can be added as the project progresses and the need arises.

The competent authority, DEA, shall be notified of any *significant* amendments or deviations in accordance with section 35 of NEMA. Such notification should be submitted with a motivation for such amendments and DEA given the opportunity to comment and review conditions of the EA. Significant amendments or deviations may necessitate an amendment of the EA which is subject to a predefined set of procedures and involves a public participation process.



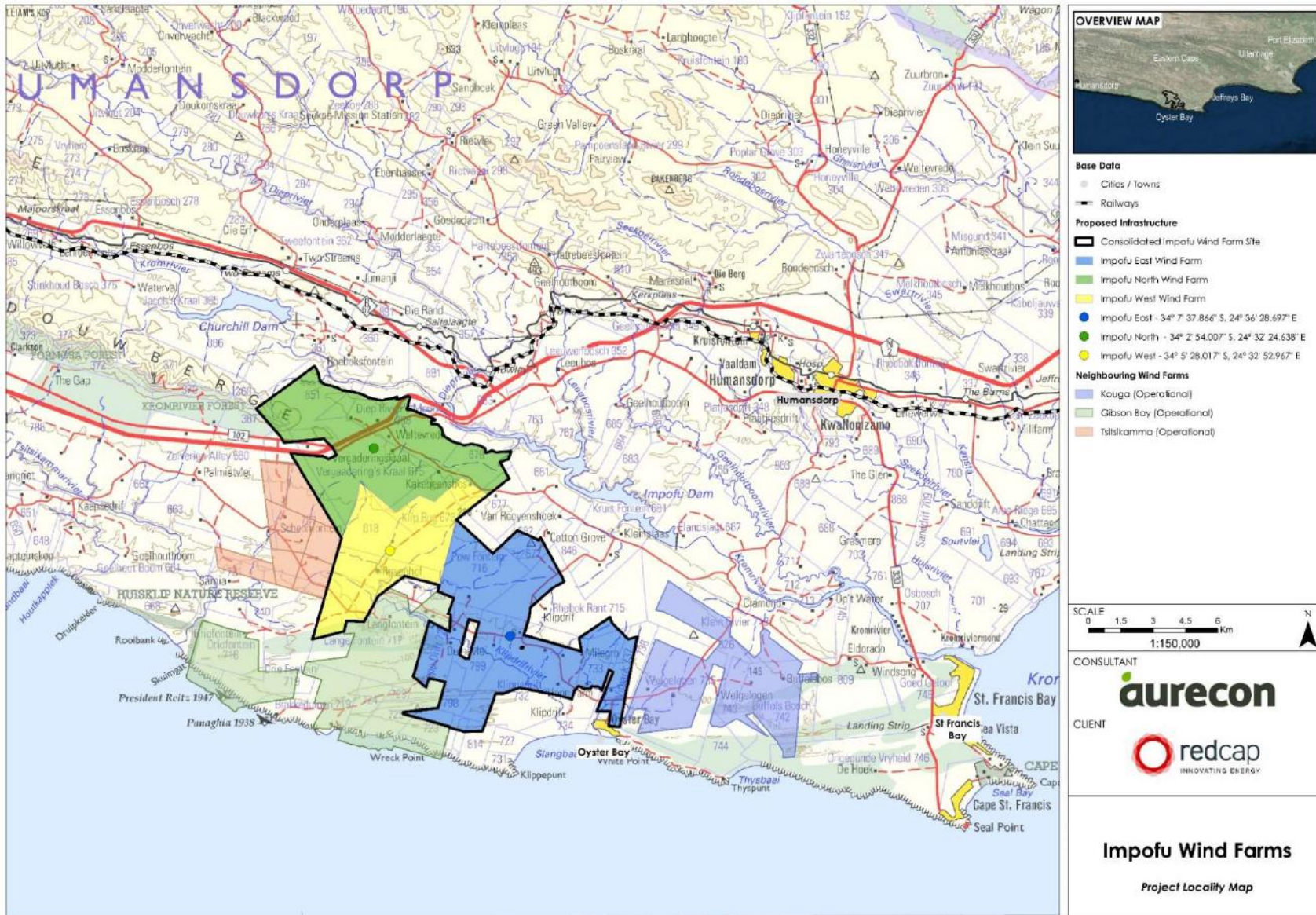


Figure 1: Location of the Impofu East Wind Farm

## 1.4 LEGAL REQUIREMENTS OF THE EMPR

### 1.4.1 National Environmental Management Act, 1998 (Act No. 107 of 1998)

In terms of the EIA Regulations (GN R982 of 4 December 2014, as amended) pursuant to the National Environmental Management Act (No. 107 of 1998) (NEMA), the proposed project triggers Activity 11 (i), 12 (ii), 19, 24 (ii), 28 (ii) and 56 (ii) of GN R983, as amended, Activity 1 (b) of GN 984 and Activity 4(a)(i), 18 (a)(i)(iii)(kk) of GN R985, as amended. As the proposed project triggers listed activities in terms of Regulation 984, as amended, it was necessary to submit a Scoping Report and Environmental Impact Report (EIR) for Environmental Authorisation (EA) to the DEA. Section 23 of the EIA Regulations requires that an EMPr be submitted as part of the EIR.

### 1.4.2 Content requirements

The contents of the EMPr must meet the requirements outlined in section 24N (2) and (3) of NEMA and Appendix 4 of the EIA Regulations '*Content of environmental management programme (EMPr)*'. The EMPr must address the potential environmental and socio-economic impacts of the proposed activity on the environment throughout the project life-cycle including an assessment of the effectiveness of monitoring and management arrangements after implementation. Table 1-1 lists the requirements of an EMPr as stipulated by Appendix 4 GN R982, as amended, and the means by which these requirements have been addressed in this document.

This document meets the EMPr requirements as legislated by the NEMA Regulations as well as falling in line with the 2013 Western Cape Government: Department of Environmental Affairs and Development Planning (DEA&DP)<sup>1</sup> guideline document for Environmental Management Programmes/ Plans and the 2004 Integrated Environmental Management Information Series 12 (Environmental Management Plans) written by the DEA.

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<sup>1</sup> This guideline has been used as a best practice tool since it is the most recent guideline on EMPs/EMPrs.

Table 1-1: Appendix 4 of EIA Regulation of GN R982 (as amendments) listing requirements of an EMPr

<b>NEMA requirements for EMPrs</b>		<b>aurecon</b>
#	Content as required by NEMA EIA Regulations Appendix 4	See
1(a)	(i) details of the EAP who prepared the EMPr; and	Section 1.5
	(ii) details of the expertise of that EAP to prepare an EMPr, including a curriculum vitae;	Section 1.5
1(b)	a detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description;	Section 2.1
1(c)	a map at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitives of the preferred site, indicating any areas that should be avoided, including buffers;	Figure 1 Figure 2 Appendix 2
1(d)	a description of the impact management objectives, 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 -	Section 4, 5 & 6 Statement above Tables
	(i) planning and design;	Section 4
	(ii) pre-construction activities;	Section 4
	(iii) construction activities;	Section 5
	(iv) rehabilitation of the environment after construction and where applicable post closure;	Section 5 & 6
	(v) where relevant, operation activities;	Section 6
1(e)	a description and identification of impact management outcomes required for the aspects contemplated in paragraph (d)	Section 4, 5 & 6
1(f)	a description of proposed impact management actions, identifying the manner in which the impact management objectives and outcomes contemplated in paragraphs (d) and (e) will be achieved, and must, where applicable, include actions to -	Section 4, 5 & 6 All Tables
	(i) avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation;	Section 4, 5 & 6 All Tables
	(ii) comply with any prescribed environmental management standards or practices;	Section 4, 5 & 6 All Tables
	(iii) comply with any applicable provisions of the Act regarding closure, where applicable; and	Section 3.7 Section 5.5 Section 7
	(iv) comply with any provisions of the Act regarding financial provisions for rehabilitation, where applicable;	N/A
1(g)	the method of monitoring the implementation of the impact management actions contemplated in paragraph (f);	Section 4, 5 & 6 Column 5 in all Tables
1(h)	the frequency of monitoring the implementation of the impact management actions contemplated in paragraph (f)	Section 4, 5 & 6 Column 5 in all Tables
1(i)	an indication of the persons who will be responsible for the implementation of the impact management actions;	Section 4, 5 & 6 Column 3 in all Tables
1(j)	the time periods within which the impact management actions contemplated in paragraph (f) must be implemented;	Section 4, 5 & 6 Column 4 in all Tables
1(k)	the mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f);	Section 3.2
1(l)	a program for reporting on compliance, taking into account the requirements as prescribed by the Regulations;	Section 3.2 Section 3.3 Section 3.4
1(m)	an environmental awareness plan describing the manner in which -	Section 3.6
	(i) the applicant intends to inform his or her employees of any environmental risk which may result from their work; and	Section 3.6
	(ii) risks must be dealt with in order to avoid pollution or the degradation of the environment; and	Section 3.6
1(n)	any specific information that may be required by the competent authority.	N/A

## 1.5 EXPERTISE OF THE ENVIRONMENTAL ASSESSMENT PRACTITIONER

Aurecon South Africa (Pty) Ltd has been appointed by Red Cap to undertake the EIA process and the development of the EMP. The *curriculum vitae* of the environmental assessment practitioners (EAPs) who compiled this report are included in Appendix 1. The key authors of this report are listed in the Table below.

**Table 1-2: Key authors of the EMP**

	Qualification	Years of Experience	Professional Affiliations
<b>Claire Blanché</b>	BSc ( <i>Hons</i> ) MEnvDev	16	Inaugural member of the Environmental Assessment Practitioners Association of South Africa (EAPASA), and International Association for Impact Assessment South Africa (IAIAsa),
	Claire is an Environmental Manager and technical advisor in Aurecon's Environmental and Planning Services with significant experience in the supervision, hands-on management of environmental impact assessments and compilation of Environmental Management Programmes. Claire has carried out a variety of environmental assessments and written several Environmental Management Programmes for a range of public and private sector projects. Claire has project management experience in EIAs, EMPs, other environmental regulatory and planning processes and associated consultation processes.		
	Qualification	Years of Experience	Professional Affiliations
<b>Kirsten Jones</b>	MSc (Environmental Science)	12	Professional Natural Scientist with the South African Council for Natural Scientific Professions (SACNASP), International Association for Impact Assessment South Africa (IAIAsa), and International Association for Public Participation (IAP2)
	Kirsten is a Senior Environmental Scientist in Aurecon's Environmental and Planning Services, with extensive experience in Environmental Authorisation and Permitting Processes in South Africa, the United Kingdom, Namibia, Malawi and Nigeria, with focus on Basic Assessment, Scoping, Environmental Impact Assessment, Environmental Management Programmes and Public Participation Process on various renewable energy, mining and natural resource management projects.		

## 2 CONTEXT

### 2.1 PROJECT DESCRIPTION

#### 2.1.1 Project location

The proposed Impofu East Wind Farm is located approximately 18 km south-west of Humansdorp, and 6 km north-west of Oyster Bay, in the Sarah Baartman District Municipality in the Eastern Cape as taken from the centre point of the site. The project site area falls within the jurisdiction of the Kouga Local Municipality within this District. The site is bounded to the east by the existing Kouga Wind Farm and the Gibson Bay Wind Farm immediately to the west. The Klipdrift River runs through the southern portion of the site.

The Impofu East Wind Farm site comprises 29 adjoining farm portions, cumulatively measuring approximately 5,142 ha in extent (Figure 2). The site is centered on 34°7'37.9" South latitude and 24°36'28.7" East longitude (as taken from the centre point of the site) and can be reached directly from the DR01774, the DR01763 and the MN50092.

#### 2.1.2 Wind Farm components

A wind farm requires a number of key components to facilitate the generation of electricity at a large scale, this includes wind turbines, powerlines and substation facilities to collect the generated electricity and distribute it to other users. The layout of the wind farm has been informed by the site sensitivities and No-Go Areas as identified by the specialists (Appendix 2). The table below (Table 2-1) provides a summary of the proposed project components and associated infrastructure.

**Table 2-1: Summary of proposed project components and associated infrastructure**

Component	Description / Dimensions
Facility area	The Impofu East Wind Farm cumulatively measures ~ 5,142 ha in extent.
Export capacity	Up to 198 MW (up to 6 MW per turbine x up to 33 turbines).
Proposed technology	Wind Energy – onshore horizontal access turbines.
Hub height from ground level	Hub height from 90 m to 120 m, rotor diameter up to 150 m (75 m blade / radius) therefore the maximum tip height will reach up to 195 m. A minimum ground clearance (i.e. lower tip height) of 30 m has been applied. <sup>2</sup> .
Area occupied by substations (including operation and maintenance buildings and areas)	Impofu East substation approximately 150 x 75, = 11,250 m <sup>2</sup>
Area occupied by both permanent and construction laydown areas	Total approximately 230,500 m <sup>2</sup> comprising of: <ul style="list-style-type: none"> <li>• Temporary construction laydown areas (turbine hardstand areas): 33 x 100 x 50 m = 165,000 m<sup>2</sup>;</li> <li>• Temporary site camp areas: 15,000 m<sup>2</sup> and batching plant area of approximately 1000 m<sup>2</sup>;</li> <li>• Permanent laydown areas of approximately 33 x 50 x 30 m = 49,500 m<sup>2</sup></li> </ul>

<sup>2</sup> Note that this is considered to represent an exacerbated rotor swept area envelope and the actual turbine used will have a fixed hub height and rotor diameter within these constraints.

Component	Description / Dimensions
Width and length of internal roads	Internal road network is ~38 km in length, here existing roads and tracks will be used as far as practicable. Permanent roads will be approximately 6 m wide. Some sections of these roads would need to be temporarily widened to 12 m during construction.
Type and height of fencing	<p>Any existing fences that are disturbed will be repaired or replaced with something similar to the original.</p> <p>Temporary fencing may be erected around the construction site offices and laydown areas, for security, health and safety reasons.</p> <p>Permanent security fencing will be installed around the substation area to prevent unauthorised access. Fencing may be up to ~ 3 m in height.</p>

#### 2.1.2.1 Wind turbines

The site infrastructure includes up to 33 wind turbines that will generate up to 6 MW per turbine with a hub height<sup>3</sup> of up to 120 m, and a rotor diameter of up to 150 m. The turbines will have a maximum upper tip height of 195 m, and a minimum lower tip height (ground clearance) of 30 m.

#### 2.1.2.2 Transmission and distribution

Each turbine will be connected to the substation by medium voltage (33kV) cabling. Where feasible, these cables will be laid underground in trenches, generally running alongside new or proposed internal roads. Where burying of cables is not possible due to technical, geological, environmental or topographical constraints, then overhead powerlines will be erected.

Energy produced by the turbines will be transmitted via medium voltage (~33 kV or lower) cables to the on-site substation. The substation facility will cover an area of approximately 11,250 m<sup>2</sup> (approximately 150 m x 75 m). The substation area would house buildings or areas for control, operation, workshop and storage.

#### 2.1.2.3 Additional infrastructure

Access from the N2 would be from either Exit 632 (Palmietvlei off ramp onto DR01776), or the Exit 647 (Kareedouw off ramp onto TR04403). The site will be accessed via the DR01744, the DR01763 and the MN50092.

Internal access and service roads will be required to access the wind farm area as well as each turbine site. Where possible, existing roads and cattle walkways have been proposed to be upgraded to avoid additional clearance of natural or agricultural land cover. New roads will be established where needed. The internal gravel roads will be approximately 6 m wide with potential side drains along the side and of a specification to accommodate the abnormal trucks that will deliver the turbine components. In exceptional circumstances short sections of the roads may be surfaced with bitumen or concrete if they are excessively steep.

A security gate/s and associated guard house/s may be placed at the entrance/s to the wind farm site. This is aimed at preventing unauthorised vehicular access to the facility. No fencing will be used around individual turbines themselves and existing fencing will remain around the perimeter of the properties. Fencing up to 3 m high will be erected around the onsite substation and the operations and maintenance complex for security and safety reasons during the operational phase. The temporary construction camp will also be fenced and should be kept secure for the duration of the construction period. Additional construction phase fencing will be brought on where needed in consultation with landowners.

<sup>3</sup> Note that this is considered to represent an exacerbated rotor swept area envelope and would likely be of less.

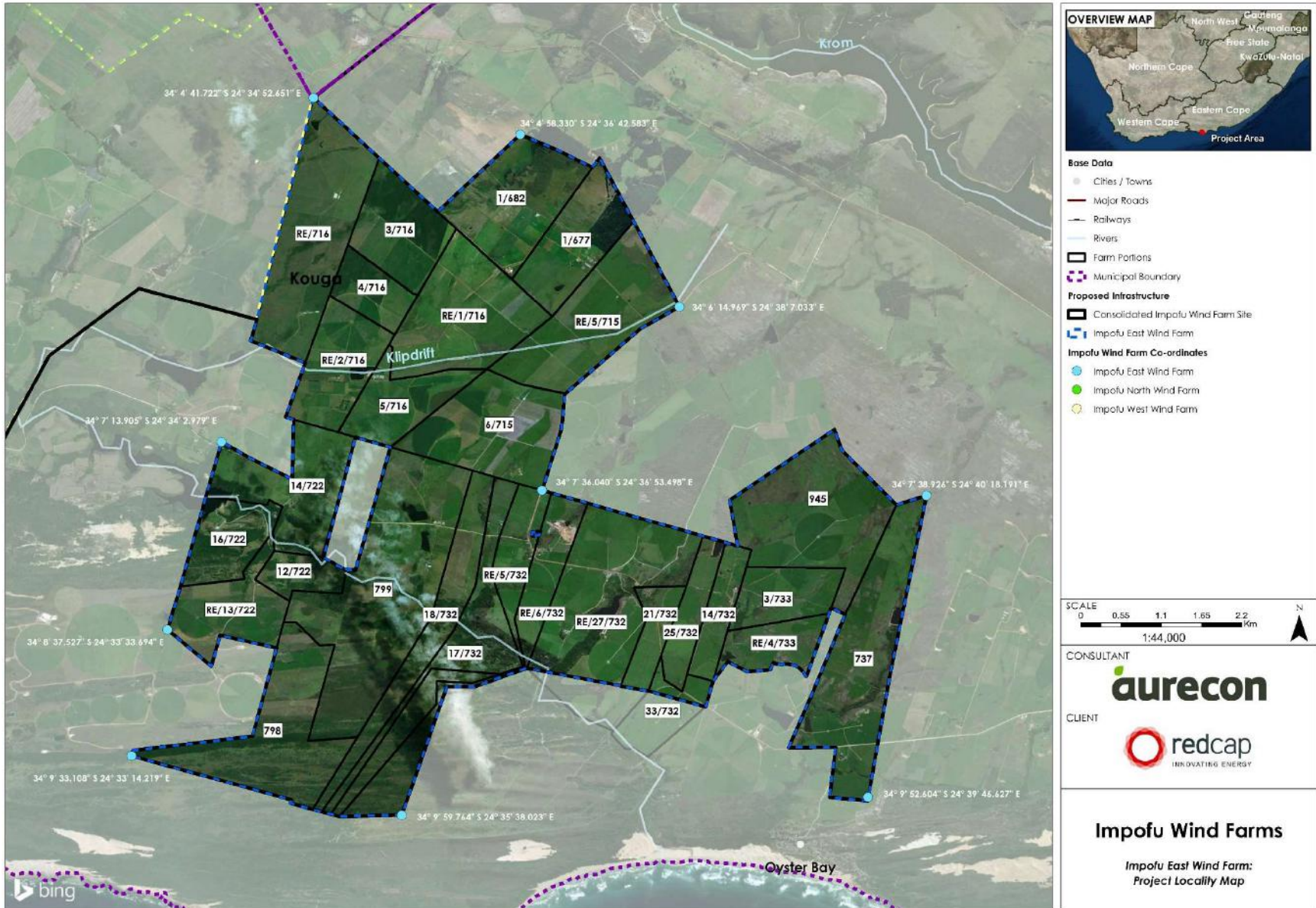


Figure 2: Impofu East Wind Farm affected properties

## 2.2 SUMMARY OF SPECIFIC IMPACTS IDENTIFIED

The EIR for the Impofu East Wind Farm and Associated Infrastructure (Aurecon, 2019– Draft Version) that informed this EMPr assessed a range of potential impacts (negative and positive) that may occur as a result of the construction, operation and decommissioning activities of the wind farm and associated infrastructure. A summary of activities associated with the Impofu East Wind Farm is provided in Table 2-2.

**Table 2-2: Summary of activities associated with Impofu East Wind Farm**

<p><b>Pre-construction</b></p> <ul style="list-style-type: none"> <li>• The site layout will be confirmed on site through a micro-siting process</li> <li>• The construction footprint boundaries will be demarcated and No-Go areas will be identified</li> <li>• Site clearance</li> <li>• Resourcing materials to the site</li> <li>• Site establishment, including establishing the construction camp</li> </ul>
<p><b>Construction</b></p> <ul style="list-style-type: none"> <li>• Construction of internal access roads</li> <li>• Turbine construction pads (crane hardstands)</li> <li>• Construction of foundations for each turbine</li> <li>• Assembling the turbines</li> <li>• Construction of on-site substation</li> <li>• Connections to on-site substation (i.e. underground cables and overhead lines)</li> <li>• Phased rehabilitation</li> </ul>
<p><b>Operation</b></p> <ul style="list-style-type: none"> <li>• Phased site rehabilitation from construction phase (all disturbed areas)</li> <li>• Areas unaffected by turbines and wind farm infrastructure retained for its intended land use</li> <li>• Generation of electricity</li> <li>• Operation and maintenance of infrastructure</li> <li>• Post-construction monitoring of bats and avifauna</li> </ul>
<p><b>Decommissioning</b></p> <ul style="list-style-type: none"> <li>• Generation of electricity ceases</li> <li>• Disconnection of the wind farm from electricity network</li> <li>• Turbine components are disassembled and recycled or disposed of</li> <li>• Infrastructure that will no longer be used (buildings, roads etc) will be removed</li> <li>• Site rehabilitation</li> <li>• Note: at the end of the anticipated lifespan of the Impofu East Wind Farm (20 years) the wind farm may not be decommissioned and may instead be upgraded / refurbished in order to continue producing electricity (subject to the necessary approvals and agreement with the land owners).</li> </ul>

The potential impacts associated with these activities were assessed by the EAP and relevant specialists' and were assigned with an anticipated impact rating (significance) for both pre and post mitigation. The significance ratings are summarized according to aspect and project phase in Table 2-3 below.



**Table 2-3: Summary of identified impacts for the Impofu East Wind Farm and associated infrastructure**

Environmental aspect	Impact	Pre-mitigation	Post-mitigation
<b>Construction</b>			
Terrestrial ecology	Loss of vegetation and plant SCC	Moderate (-)	Minor (-)
	Direct and indirect impacts on fauna	Minor (-)	Minor (-)
Aquatic ecology	Loss of aquatic species of special concern	Minor (-)	Negligible (-)
	Loss of remaining wetlands with high sensitivity	Minor (-)	Negligible (-)
	Loss of riparian systems and watercourses	Minor (-)	Negligible (-)
	Impact on localised water quality	Minor (-)	Negligible (-)
Bats	Destruction of foraging habitat by clearing vegetation	Negligible (-)	Negligible (-)
Avifauna	Destruction of bird habitat	Moderate (-)	*Low to Moderate (-)
	Disturbance of birds	Negligible (-)	Negligible (-)
Agriculture	Loss of agricultural land use	Minor (-)	Minor (-)
	Discontinuation of farming activities	Negligible (-)	N/A
	Interference with farming operations	Negligible (-)	Negligible (-)
	Degradation to natural agricultural resource base	Negligible (-)	Negligible (-)
	Depletion of potential agricultural water resources	Negligible (-)	N/A
	Increased financial security for farmers	Moderate (+)	N/A
	Improvements to shared infrastructure	Minor (+)	Minor (+)
	Improved farm security	Negligible (+)	N/A
Socio-economic	Temporary stimulation of the national and local economy	Moderate (+)	Moderate (+)
	Temporary increase of new employment opportunities in the national and local economies	Moderate (+)	Moderate (+)
	Contribution to skills development in the country and local economy	Minor (+)	Moderate (+)
	Temporary increase in household earnings	Minor (+)	Minor (+)
	Temporary increase in government revenue	Minor (+)	Minor (+)
	Impact on property and land value in the immediately affected area	Negligible (+)	Negligible (+)
	Changes to the sense of place	Minor (-)	Minor (-)
	Temporary increase in social disruptions associated with the influx of people	Minor (-)	Negligible (-)
	Impact on economic and social infrastructure	Minor (-)	Negligible (-)
Archaeology	Impact on isolated specimens and low-density stone age artefact scatters	Major (-)	*Neutral to negligible (-)
	Impact to the pre-colonial cultural landscape along 5 km wide coastal strip	Moderate (-)	*Neutral to negligible (-)
Noise	Construction noise	Minor (-)	Minor (-)
Visual	Visual intrusion on the rural landscape and scenic resources	Moderate (-)	Minor (-)
Traffic	Deterioration of road condition due to increased traffic volumes	Minor (-)	Minor (+)
	Incidents due to increased traffic volumes	Minor (-)	Negligible (-)
	Delivery of concrete	Moderate (-)	Minor (-)

Environmental aspect	Impact	Pre-mitigation	Post-mitigation
<b>Operation</b>			
Terrestrial Ecology	Impacts on fauna	Moderate (-)	Minor (-)
	Impacts on CBAs	Moderate (-)	Minor (+)
Aquatic ecology	Impact on aquatic systems through increase in surface water runoff	Minor (-)	Negligible (-)
Bats	Bat mortalities due to moving turbine blades	Moderate (-)	Minor (-)
	Bat mortalities due to light attraction	Moderate (-)	Negligible (-)
Avifauna	Disturbance of birds	Minor (-)	Minor (-)
	Displacement of birds	Negligible (-)	Negligible (-)
	Bird fatality through collision with turbine blades	Moderate (-)	Moderate (-)
	Bird collision and electrocution on overhead power lines	Minor (-)	Negligible (-)
Agriculture	Loss of agricultural land use	Minor (-)	Minor (-)
	Discontinuation of farming activities	Negligible (-)	N/A
	Interference with farming operations	Negligible (-)	Negligible (-)
	Degradation to natural agricultural resource base	Negligible (-)	Negligible (-)
	Depletion of potential agricultural water resources	Negligible (-)	N/A
	Increased financial security for farmers	Moderate (+)	N/A
	Improvements to shared infrastructure	Minor (+)	Minor (+)
Socio-economic	Improved farm security	Negligible (+)	N/A
	Sustainable increase in production and GDP nationally and locally	Moderate (+)	Moderate (+)
	Creation of sustainable employment positions nationally and locally	Moderate (+)	Moderate (+)
	Skills development of permanently employed workers	Moderate (+)	Moderate (+)
	Improved standard of living for benefiting households	Minor (+)	Minor (+)
	Sustainable increase in national and local government revenue	Moderate (+)	Moderate (+)
	Provision of electricity for future development	Moderate (+)	Moderate (+)
	Local economic and social development benefits derived from operations	Moderate (+)	Moderate (+)
	Improvement of the livelihoods of the households dependent on the local agricultural sector	Moderate (+)	Moderate (+)
Negative changes to the sense of place	Negligible (-)	Negligible (-)	
Noise	Operational noise	Negligible (-)	Negligible (-)
Shadow flicker	Shadow flicker	Minor (-)	Negligible (-)
Visual	Visual intrusion of the wind turbines on the rural landscape, settlements, scenic resources and overall sense of place	*Major – moderate (-)	Major moderate (-)
	Visual intrusion of related infrastructure on the rural farming landscape	Moderate (-)	Minor (-)
	Visual intrusion of lights at night on dark skies	Moderate (-)	Moderate (-)
	Visual intrusion of remaining structures and access roads on the rural landscape	Moderate (-)	Minor (-)
Traffic	Deterioration of road condition due to increased traffic volumes	Minor (-)	Minor (+)

Environmental aspect	Impact	Pre-mitigation	Post-mitigation
	Incidents due to increased traffic volumes	Minor (-)	Negligible (-)
<b>Decommissioning</b>			
Terrestrial ecology	Alien plant invasion following decommissioning	Minor (-)	Minor (-)
	Faunal impacts due to decommissioning.	Minor (-)	Minor (-)
Aquatic ecology	Loss of aquatic species of special concern	Minor (-)	Negligible (-)
	Loss of riparian systems and watercourses	Minor (-)	Negligible (-)
	Impact on localised water quality	Minor (-)	Negligible (-)
Avifauna	Disturbance of birds	Negligible (-)	Negligible (-)
Agriculture	Loss of agricultural land use	Minor (-)	Minor (-)
	Discontinuation of farming activities	Negligible (-)	N/A
	Interference with farming operations	Negligible (-)	Negligible (-)
	Degradation to natural agricultural resource base	Negligible (-)	Negligible (-)
	Depletion of potential agricultural water resources	Negligible (-)	N/A
	Increased financial security for farmers	Moderate (+)	N/A
	Improvements to shared infrastructure	Minor (+)	Minor (+)
	Improved farm security	Negligible (+)	N/A
Socio-economic	Temporary stimulation of the national and local economy	Moderate (+)	Moderate (+)
	Temporary increase of new employment opportunities in the national and local economies	Moderate (+)	Moderate (+)
	Temporary increase in household earnings	Minor (+)	Minor (+)
	Temporary increase in government revenue	Minor (+)	Minor (+)
	Changes to the sense of place	Minor (-)	Minor (-)
	Temporary increase in social disruptions associated with the influx of people	Minor (-)	Negligible (-)
	Impact on economic and social infrastructure	Minor (-)	Negligible (-)
Noise	Decommissioning noise	Minor (-)	Minor (-)
Visual	Visual intrusion of remaining infrastructure on the rural landscape	Moderate (-)	Minor (-)

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# SECTION B: ENVIRONMENTAL MANAGEMENT PROGRAMME

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## 3 IMPLEMENTATION OF THE EMPR

### 3.1 ROLES AND RESPONSIBILITIES

Several role-players are required to participate actively in the implementation of the EMPr with different roles and responsibilities assigned to each. This section sets out these roles and responsibilities.

#### 3.1.1 Proponent

The 'Proponent' refers to the holder of the Environmental Authorisation (if granted). The Proponent (or its successor in title) shall take overall responsibility for the project. The Proponent will be responsible for the operation and maintenance of the infrastructure, as well as decommissioning should the need to decommission the infrastructure ever arise.

The role of the Proponent (pertaining to environmental matters) will include:

- Assuming overall responsibility for the administration and implementation of the EMPr.
- Ensuring that other role players fulfil their obligations in terms of this EMPr.
- Appointing suitably qualified Professionals to fulfil the roles and responsibilities described in the EMPr; namely:
  - An agent of the Proponent to administer the Contract (e.g. suitably qualified and experienced Project Manager or Engineer to act as the Contract Manager).
  - An Independent Environmental Control Officer (ECO) to monitor compliance with the approved EMPr and conditions of the EA (relevant to the construction activities) for the duration of the construction phase.
  - An independent Community Liaison Officer (CLO) who is a member of one of the local communities in the vicinity of the wind farm to facilitate community relations for the duration of the construction phase.
- Ensuring all the necessary approvals, permits, authorisations and requirements set by the relevant National and Provincial Departments, and the Local Authority have been obtained, and are complied with prior to any site activities being undertaken.

#### 3.1.2 Environmental Control Officer (ECO)

The 'ECO' refers to the independent party responsible for the environmental monitoring and auditing activities required by the EMPr for the construction activities. The ECO shall be appointed by the Proponent, and the designation shall be reserved for a suitably qualified (National Diploma/Degree in Natural Science or an equivalent qualification), independent environmental manager. The ECO shall have adequate environmental knowledge and experience to understand the detailed environmental issues associated with this project and is to be well-versed in the contents of the EMPr and any of its associated reports.

The role of the ECO will include:

- Liaison with the Contract Manager, Contractor (including the Environmental Site Officer or ESO) and DEA, as required.
- Routine monitoring of the Contractor's activities for compliance with the various environmental requirements contained in the EMPr, including:
  - Undertaking compliance inspections and audits at defined intervals as per the ECO Schedule in Section 3.2.1 and the requirements of the conditions of the EA.
  - Preparing reports on the findings of the inspections and audits, as well as on any emergency or unforeseen situations in which the expertise of the ECO has been consulted.
  - Making reports available to the Contract Manager and the Contractor as per the ECO Schedule in Section 3.2.1 and to DEA on request.
- Reviewing of the Contractor's Method Statements (from an environmental perspective) required in terms of this EMPr, prior to the proposed activities taking place.
- Monitoring the requisite remedial action undertaken by the Contractor following an environmental incident, event or finding of non-compliance, and capturing proof of such in the subsequent inspection audit.

- Reviewing the Contractor's register of public complaints and confirming that all public comments or issues have been appropriately reported and addressed, including that proof of such action has been retained.
- Providing ad-hoc environmental advice, including opinion on environmental legal requirements, to the Proponent and the Contractor regarding issues that may arise during the Contract.
- Reviewing and updating the EMPr as and where necessary.

### 3.1.3 Engineer and Contract Manager

The term "Engineer" in the context of the EMPr refers to the company or companies so named in the Contract Data, whose function it is to administer the Contract as an agent to the Proponent. The term "Engineer" may also refer to "Employer's Agent" or "Project Manager" depending on the construction contract.

The natural person nominated by the Engineer, who shall observe the execution of the Works, examine and test materials and workmanship, and deliver and receive communications to/from the Contractor is the Contract Manager. The term "Contract Manager" may also refer to "Employer's Agent Representative" or "Supervisor" depending on the construction contract.

The role of the Contract Manager (pertaining to environmental matters) will include:

- Acting as an agent to the Proponent on matters relating to the environment, and compliance with the EMPr.
- Receiving reports from the ECO and reporting to the Proponent, as well as ensuring issues raised in the reports are addressed by the responsible parties.
- Approving, in consultation with the ECO, the Contractor's Method Statements required in terms of this EMPr.
- Ensuring that the Contractor is well-versed in the contents of this EMPr.
- Ensuring the Contractor is aware that their conduct must be proactive and effective in implementation and management of environmental protection measures.
- Ensuring the Contractor is aware of their responsibilities in terms of this EMPr, including (but not limited to):
  - Approving the Environmental Site Officer (ESO) nominated by the Contractor to oversee the implementation of this EMPr.
  - Ensuring that the Contractor is aware that a register of public complaints shall be maintained, that all public comments or issues shall be appropriately reported and addressed, and that proof of such shall be maintained for compliance purposes.
  - Instructing the Contractor to cease work, if so required by DEA, the ECO or EMPr, and issuing fines or disciplinary action to the responsible parties in the event of non-compliance of the EMPr in accordance with Section 3.2.2, as necessary.
  - Supporting the ECO in their role and responsibilities by ensuring the Contractor undertakes the requisite remedial action in the event of non-compliance.

### 3.1.4 Contractor

The term 'Contractor' in the context of the EMPr refers to the main appointed Contractor responsible for any site activities, or portion of the site activities required for the construction phase of the project. The Contractor shall be responsible for ensuring the day-to-day implementation of the EMPr during the construction activities, and shall therefore be well-versed in the relevant sections of this document. The Contractor shall conduct activities in a manner that will cause the least possible disturbance to the existing amenities, whether natural or man-made, in accordance with all the currently applicable statutory requirements as specified in the EMPr. Disturbance or disruption of the daily lives of local communities shall be avoided wherever possible.

The role of the Contractor (pertaining to environmental matters) will include:

- Liaison with the Contract Manager, ECO and DEA as required.
- Assuming the responsibility for the administration and implementation of sections of the EMPr relevant to the Contract.
- Nominating a suitable member of staff to fulfil the role of ESO and providing the details of this person to the Contract Manager for approval.
- Ensuring all work areas and site activities pertaining to the Contract conducted in an environmentally sensitive manner and in accordance with the relevant sections of the EMPr.



- Providing Environmental Awareness Training, Staff Induction Training and Emergency Response Procedures to all staff, ensuring that they are adequately informed of the requirements of the EMPr pertaining to their site role, and that they clearly understand the written Code of Conduct.
- Ensuring that any sub-contractors, suppliers or visitors to the site understand the relevant sections of the EMPr pertaining to their role on-site.
- Supplying method statements required in terms of this EMPr (either specified, or for any activities that are proposed as variations to the standard construction practices detailed or referred to in the Contract Documents, or for any activities requiring special attention as specified in this EMPr and/or requested by the ECO or Competent Authority).
- Liaising closely with the ECO on any environmental management issues, environmental incidents or events, or emergencies impacting the environment.
- Addressing the findings of the ECO inspections, as well reacting to any instructions issued by the Contract Manager with respect to non-compliance with the EMPr, emergency or unforeseen situations, or complaints/issues raised by the public.
- Providing an Environmental Incident Report File and a Complaints Register.

### 3.1.5 Environmental Site Officer (ESO)

The 'ESO' refers to the nominated staff member of the Contractor who will fulfil the role of the Contractor's environmental representative to monitor, review and verify compliance with the EMPr. The ESO shall liaise closely with the Contract Manager and the ECO and shall ensure that the works on site are conducted in an environmentally responsible manner and in compliance with the requirements of the EMPr.

The role of the ESO will include:

- Liaison between the Contractor and ECO on matters relating to the environmental considerations on site.
- Assisting with the compilation of environmental components of Method Statements on behalf of the Contractor.
- Being appointed to the site throughout the duration of the construction phase.
- Undertaking daily inspections of the various work areas to ensure all activities are being undertaken in accordance with the EMPr.
- Maintaining all site documentation and records pertaining to the EMPr and environmental matters and approvals.
- Providing a regular and routine account on environmental matters for the ECO, including any environmental incidents, events or accidents, and reporting on any entries in the Environmental Incident Report File or Complaints Register. This account may take the form of a written report or checklist or similar, or meeting with the ECO.
- Overseeing that corrective action is implemented within the stipulated timeframes where non-compliances are registered.
- Responding to and reporting on environmental accidents, incidents and events immediately, and overseeing all works requiring remediation are undertaken in accordance with the ECO or Contract Manager's instructions.

### 3.1.6 Community Liaison Officer (CLO)

The "CLO" refers to an independent Community Liaison Officer who ideally is a member of one of the local communities in the vicinity of the wind farm.

The role of the CLO will include:

- Facilitation of community relations for the duration of the construction phase.
- Providing recommendations for, and facilitation the notification or information dissemination methods for issues such as any planned service disruptions or nuisance disturbances.
- Liaise with the complainants to address any issues.

## 3.2 COMPLIANCE MONITORING

### 3.2.1 ECO schedule

#### **Routine compliance inspections and reports:**

The Contractor shall allow the ECO (and any officials from DEA, should the need arise) access to the site for the purposes of compliance monitoring. The ECO shall undertake routine monitoring of the Contractor's activities for compliance with the various environmental requirements contained in the EMPr; including but not limited to:

- Undertaking routine compliance inspections:
  - On a weekly basis for all development sites, or at the defined intervals as provided in the conditions of the EA if these are more frequent.
  - Documenting the findings of each of the inspections. This may take the form of a diary entries, a checklist, a report or similar, but should include dated photographic evidence of any identified issues (where possible). Any findings of non-compliance must be clearly communicated to the Contractor, together with timeframes for the implementation of remedial action and close out.
- Preparing a monthly report:
  - Summarising the findings of the routine compliance inspections undertaken as well as progress on any remedial action that was required during the month in question. In the event of non-compliance, the report might include:
    - Relevant/ supporting documentation or evidence of the non-compliance (e.g. minutes of any meetings held to discuss the non-compliance, email/written correspondence on the matter, dated photographic evidence).
    - Remedial action required to remedy non-compliance or prevent repeat occurrences, including responsible persons and deadlines for such action.
    - Dates of eventual compliance or close-out by the Contractor on previous non-compliance findings.
- Making reports available to the Contract Manager and the Contractor, and to DEA on request.
- Attending or submitting the monthly report to a minimum of one monthly progress meeting with the project team, which shall include the Contract Manager, the Contractor and the ESO (or representatives).

#### **Environmental emergencies, incidents or events:**

Should there be any environmental emergencies or incidents, then the ECO may also elect to inspect the site in the event of these. The ECO shall ensure that any entries in the Environmental Incident Report File and Complaints Register are tabled at the monthly progress meeting and appropriately addressed.

### 3.2.2 Disciplinary action, penalties and fines

Where a transgression occurs due to negligence, or due to disregard for the requirements of the EMPr, or due to ignoring remedial instruction from the ECO, Contract Manager or relevant Authority, then this is unacceptable, and could result in a disciplinary action (e.g. a time penalty or a monetary fine, withholding payment certificates if in accordance with the terms of Contract, or even legal action). The terms of Contract shall include mechanisms for disciplinary action (such as the issuing penalties and fines), and the recovery of any monies due (including for any remedial costs where these were born by a third party).

The level of non-compliance is ultimately to the discretion of the ECO, Contract Manager and the Authorities, but a guide to determining this level in the event of negligence or disregard, and the associated minimum monetary fine is provided in Table 3-1 below (the table does not include for penalties or other mechanisms of disciplinary action, which could be implemented in addition to the monetary fine). Record shall be kept of any penalties or monetary fines issued for environmental transgressions (refer Section 3.8).

Activities that are directly endangering the environment or are resulting in a significant and detrimental breach of any Environmental Authorisation or EMPr condition may be stopped by the Contract Manager in consultation with the ECO until such breach is rectified. Regulatory authorities such as the DEA and Eastern Cape Department of Economic Development, Environmental Affairs and Tourism (DEDEAT) also have the right to stop activities in consultation with the Engineer, Contract Manager and ECO.

In all instances where costs are incurred in rectifying a breach of the EMPr, enforcing the provisions of the EMPr, or in taking remedial or preventative action to safeguard the environmental integrity, the costs will be recovered jointly or severally from the Proponent and/or the Contractor. Note must be taken in this respect of Section 28 of NEMA which places a duty of care for environmental protection on “every person who causes, has caused or may cause significant pollution or degradation of the environment”.

**Table 3-1: Guide to fine determination**

Level of Non-Compliance	Description	Minimum Fine
Minor non-compliance (>3 repeated offences)	A non-conformance with the EMPr that has the potential to result in minor environmental or social consequence	R 2,000.00
Moderate non-compliance (>2 repeated offences)	A non-conformance with the EMPr that results in minor environmental or social consequence, or has the potential to result in major environmental or social consequence	R 5,000.00
Major non-compliance (1st offence)	A non-conformance with the EMPr that results in major environmental or social consequence	R 10,000.00

*\*These fines will be escalated by CPI every 12 months from commencement date of contract.*

### 3.3 ENVIRONMENTAL INCIDENT REPORT FILE

The Contractor shall keep an Environmental Incident Report File (EIRF) on site to document any environmental incidents, emergencies or accidents occurring as a result of the construction activities, and any resulting action taken to remedy the harm, and/or prevent repeat occurrences:

- The EIRF shall have numbered pages. Any missing pages must be accounted for by the Contractor.
- Entries made shall be tabled during monthly site meetings.
- The EIRF shall be made available to the Contract Manager, the ECO, the Proponent, and/or any authority at any time if requested.

The EIRF is to make provision for the documentation of:

- The exact nature of the environmental incident.
- The management team or contractor responsible for the activity.
- The timing and duration of the event.
- Witnesses to the event.
- The exact response action applied, including a list of those notified of the problem.

The Contractor shall ensure that the environmental incidents and resulting action are recorded in the EIRF, and that these are brought to the attention of the ECO as soon as practically possible. The procedure for dealing with an environmental incident shall include that:

- The EIRF is to be filled in by the ESO in the event of an environmental incident or emergency.
- The ESO is to immediately inform the Contractor and ECO and of any environmental emergency for a decision on remedial action.
- The ECO is to document any incidents / emergencies in the monthly compliance report, together with the remedial action taken, as described in the EIRF.
- The ECO shall monitor that the necessary procedures and responses are followed by the Contractor to close out any entries in the EIRF within the specified timeframe.
- Once an incident or emergency has been adequately addressed to the satisfaction of the ECO, the ESO is to close out the entry in the EIRF.

## 3.4 COMPLAINTS REGISTER

The Contractor shall keep a Complaints Register on site to allow the general public to document any comments on or complaints regarding the activities of the site:

- The Complaints Register shall have numbered pages. Any missing pages must be accounted for by the Contractor.
- Entries made shall be tabled during monthly site meetings.
- The Complaint Register shall be made available to the Contract Manager, the ECO, the Proponent, and/or any authority at any time if requested.

The Complaints Register shall include a section for the documentation of the action taken to address the complaint. The procedure for dealing with public complaints shall include that:

- All complaints shall be investigated, and a response shall be given to the complainant within 28 calendar days.
- The ESO shall document the action taken to investigate, and address (if required) the complaint, as well as the response given (including timeframes).
- The ECO shall monitor that the complaints have been responded to.
- The ECO shall ensure that any public issues have been brought to the attention of the relevant authorities by the Contractor if so required, and appropriately addressed.

## 3.5 METHOD STATEMENTS

An environmental Method Statement is a written submission by the Contractor to the Contract Manager, to the satisfaction of the ECO, in response to a condition of approval and/or a requirement of the EMPr, or a request by the ECO or Contract Manager. The Method Statement describes the plant, materials, labour and method that the Contractor proposes to use to carry out an activity, in such detail that the Contract Manager and ECO are able to assess whether the Contractor's proposal is in accordance with the Scope of Work and/or will produce results in accordance with the EMPr.

Method Statements are required in terms of this EMPr (either specified below, or for any activities that are proposed as variations to the standard construction practices detailed or referred to in the Contract Documents, or for any activities requiring special attention as specified in this EMPr and/or requested by the ECO or Contracts Manager as well as any requirements of permits or licenses such as a Water Use License).

The Contractor shall not commence any activity until the Method Statement in respect thereof has been approved and shall, except in the case of emergency activities, allow a period of one week for consideration of the Method Statement by the Contract Manager and ECO. Changes may be requested if the proposal does not comply with the specification or if, in the reasonable opinion of the Contract Manager and/or ECO, the proposal may result in, or carries a greater than reasonable risk of, damage to the environment in excess of that permitted by the EMPr:

- Approval of the Method Statement shall not absolve the Contractor from any of his obligations or responsibilities in terms of the Contract.
- Approved Method Statements shall be readily available on the site and shall be communicated to all relevant personnel. The Contractor shall carry out the works in accordance with the approved Method Statement.
- Any proposed changes to the original approved environmental Method Statements require the submission of amended Method Statements for approval, and these amendments require the signatures of the Contractor, the ECO and the Contract's Manager.

### 3.5.1 Required Method Statements

The following required Method Statements (as relevant and if not already required in terms of the Contract) are to be provided within 14 calendar days of commencement of Contract:

- **Emergency preparedness** – which shall address procedures and equipment for medical emergencies, runaway fires, environmental incidents, site evacuation and staff assembly.

- **Site establishment** – which shall address Contractor’s camp/s, lay-down or storage areas, site access and required infrastructure.
- **Ablution facilities** – which shall address washing facilities (including methods for managing grey water) and toilets (including the number of, location and method of securing portable/chemical toilets to the ground (if not trailer versions), the proposed service providers to remove and dispose of resultant waste and their service schedule).
- Hazardous Chemical Substances (as defined in the Regulations for Hazardous Chemical Substances in GN 179 (25 August 1995)), hydrocarbon substances (which includes all fuels and oils) or dangerous goods to be used – which shall address the storage, handling and disposal procedures of the materials.
- **Hydrocarbon spills** – which shall address the procedures, reporting and training required to address accidental spills.
- **Concrete mixing and batching plants** – which shall address locations, bunding, and cement-laden water management.
- **Waste Management** – which shall address the type of waste anticipated; the storage, handling, reuse, recycling and/or disposal procedures proposed, together with the facilities proposed to receive such waste.

The following required Method Statements (as relevant and if not already required in terms of the Contract) are to be provided within 14 calendar days prior to the programmed commencement date of the subject works or activity:

- No-Go area demarcation and access control within the approved development site/servitudes.
- Workshop and plant servicing.
- Vegetation clearing – including methods and areas for clearing and felling.
- Stockpile management – including proposed locations and erosion management.
- Access management – including proposed engagement with affected landowner/s, proposed routes, gates, and fencing, crossings, access control, existing services management.
- Working in watercourses or wetlands - access, crossings, dewatering activities.
- Heritage Resource protection within the development site.
- Traffic and Detour Management – lane closures, signalman, alternative routes, etc.

### 3.5.2 Additional Method Statements (on request)

Method statements may also be requested by the ECO or Contract Manager as the need arises. The Contractor shall submit any additional Method Statements that arise within such reasonable time as the ECO or Contract Manager shall specify.

### 3.5.3 Content

For each instance when it is required or requested that the Contractor submit a Method Statement to the satisfaction of the ECO, the format shall clearly indicate the following:

**Who:** Nominated representative and their assigned responsibilities (in relevant instances).

**What:** A brief description of the activity to be undertaken (and in relevant instances, the proposed variation from or deviation to the Contract Documentation, or this EMPr).

**How:** A detailed description of the work, methods, materials, or process proposed (and in relevant instances any reinstatement/rehabilitation requirements).

**Where:** A description/sketch map of the locality of work or layout proposed.

**When:** The sequencing of actions with due commencement dates and completion date estimates.

The Contractor (and, where relevant, any sub-contractors) must also sign the Method Statement, thereby indicating that the work will be carried out according to the methodology contained in the approved Method Statement. An example of a Method Statement form can be found in Appendix 3.

## 3.6 ENVIRONMENTAL AWARENESS AND STAFF INDUCTION

The Contractor shall ensure that all staff receive site environmental awareness and staff induction training in appropriate languages, as well as any refresher courses, pertaining to their role on the project, including that:

- All personnel (including sub-contractors) shall receive induction training on the Code of Conduct and project specific environmental awareness relating to the conditions of the EA and EMPr prior to commencing with any site activities.
- All personnel shall receive induction training on the emergency procedures to be followed in the event of an emergency (e.g. staff assembly and site evacuation, medical emergencies, the locations and basic use of fire extinguishers, first aid kits and spills kits, and the use of safety equipment (where relevant)).
- Relevant staff (including sub-contractors) shall receive induction training on landowner considerations, including access and transport routes on each property, gate management, communication expectations, etc.
- Relevant staff (including sub-contractors) shall receive induction training by a professional and suitably experienced archaeologist to ensure that all persons working on the wind farm site are familiar with the types of heritage resources that may be exposed during construction and the necessary steps to follow in the event that archaeological resources are unearthed.
- All personnel (including sub-contractors) shall receive regular toolbox talks and refresher courses on the induction material, and project specific environmental awareness for the duration of the contract, including “lessons learnt” to prevent recurring issues.

The Contractor shall:

- Allow sufficient sessions for the training with no more than 20 personnel attending each course.
- Ensure that all new staff must receive environmental awareness and staff induction training.
- Erect and maintain information posters at the Contractor’s camp.
- Retain attendance registers on completion of any training (all attendees must sign these registers), and this shall be made available on request by the ECO or relevant authority.

Training and inductions shall include the following (as relevant):

- Material to ensure that all personnel understand their roles and responsibilities and the implications of non-compliance with the EMPr.
- Material to address, but not be limited to, basic environmental awareness, prevention of water, soil, and air pollution, prevention of soil erosion and sedimentation, water saving practices, basic principles of materials handling and storage, fire risks, emergency preparedness and incident responses, spill response provisions, social responsibility (including HIV/AIDS and TB awareness), administrative and reporting procedures.

An example of an Environmental Awareness and Induction Training Course is included in Appendix 4.

## 3.7 TEMPORARY SITE CLOSURE

If the site is closed for a period exceeding one week during the construction or decommissioning phase, the Contractor, in consultation with the ECO shall carry out the following checklist procedure.

- Hazardous materials stores
  - Outlet secure/locked
  - Bund empty (where applicable)
  - Fire extinguishers serviced and accessible
  - Emergency and responsible personnel contact details displayed on site
  - Adequate ventilation in hazardous substance stores
- Safety
  - All trenches and manholes secured and closed
  - Fencing and barriers in place
  - Material packs (e.g. pile of pipes) secured
  - Access gates locked and secured
- Erosion
  - Wind and dust mitigation in place
  - Slopes and stockpiles at stable angle
  - Open soil re-vegetated or stabilised
- Water contamination and pollution
  - Cement and hazardous materials stores secured
  - Toilets empty and secured
  - Refuse bins empty and secured
  - Drip trays empty and secured (where possible)
  - Structures vulnerable to high winds secured
  - Drip trays are empty and secure.

## 3.8 RECORD KEEPING

All records and documents relating to the implementation of this EMPr shall be retained, shall be easily retrievable for the duration of the Contract, and shall be filed by the Contractor for a minimum of 12 months after cessation of activities. These records and documents must be made available to the Contract Manager, ECO and/or relevant authority upon request.

These records and documents shall include (but shall not be limited to) the most recent versions of:

- The Environmental Authorisation.
- Permits, licenses and registrations.
- The EMPr and any associated management plans.
- EIRF and Complaints Register.
- Approved Method Statements.
- Staff induction and environmental training material and attendance registers.
- Checklists for temporary site closure.
- Monthly compliance reports prepared by the ECO.
- Certificates of disposal.
- Disciplinary action (including time penalties or monetary fines) for environmental transgressions.
- Independent Environmental Audits.

## 4 PRE-CONSTRUCTION PHASE

### 4.1 LEGAL COMPLIANCE

#### 4.1.1 EMPr inclusion

These measures will ensure the EMPr forms part of the contract documents, its requirements advise the design phase and that the relevant appointments are made:

Item	Requirement	Responsibility	Implementation Timeframe	Monitoring
4.1.1.1	This EMPr is an extension of the conditions of the Environmental Authorisation and is binding on all parties involved in this project.	Proponent	Duration of project	DEA
4.1.1.2	This EMPr is to form part of the contract documentation for tender such that the Contractor/s is/are aware of its conditions and associated pricing implications.	Engineer	Tender Process	Proponent
4.1.1.3	This EMPr will advise the design phase of the project in terms of providing the environmental requirements with regards to pylon locations, routing options, access choices and mitigation / management options.	Engineer	Detailed Design Phase	EAP
4.1.1.4	The appointments associated with the project team required to implement this EMPr shall be made prior to any activities (that may require their attention) being undertaken.	Proponent	Prior to commencement	DEA

#### 4.1.2 Permits, licenses, and registrations

These measures will ensure that activities are executed in accordance with the law and requirements of the relevant authority:

Item	Requirement	Responsibility	Implementation Timeframe	Monitoring
4.1.2.1	Should any permits, licenses or registrations be required then the Proponent shall ensure that these are applied for by a relevant specialist/professional, and that these are obtained prior to such activities commencing. Typical activities include (but are not restricted to): <ul style="list-style-type: none"> <li>The rescue, relocation or destruction of certain protected plants.</li> <li>The disturbance, damage, destruction or alteration of known heritage resources.</li> <li>Any water uses as listed in Section 21 of the National Water Act (No. 36 of 1998).</li> <li>Proposed quarries, borrowpits, or sand mining operations.</li> <li>The subdivision, rezoning or registration of a servitude.</li> </ul>	Proponent to engage with relevant specialist	Prior to commencement of activity requiring permission	Relevant Competent Authority
	<b>Permits to rescue, transport, translocate or destroy protected plants in terms of NEM:BA</b>			



4.1.2.2	Protected plant species may require a permit to be issued by the DEDEAT in terms of the National Environmental Management: Biodiversity Act (No. 10 of 2004) before they may be disturbed, rescued, transported, translocated or destroyed.	Proponent to engage with relevant specialist	Prior to commencement of activity requiring permission	DEDEAT
4.1.2.3	Where protected trees species cannot be avoided or where clearance of forest is required, then the relevant permits shall be obtained from the Department of Agriculture, Forestry and Fisheries (DAFF).	Proponent to engage with relevant specialist	Prior to commencement of activity requiring permission	DAFF
	<b>Permits to damage or destroy heritage resources in terms of the NHRA</b>			
4.1.2.4	If it is not possible to avoid the archaeological sites, or mitigation is found to be more feasible than in-situ conservation, a permit in terms of Section 35 of the National Heritage Resources Act (No 25 of 1999) (NHRA) and Chapter IV of the NHRA Regulations must be applied for by a professional archaeologist prior to construction. Mitigation of the archaeological sites may only occur if permitted by the South African Heritage Resources Agency (SAHRA) or the Eastern Cape Provincial Heritage Resources Agency (ECPHRA).	Proponent to engage with Archaeologist	Prior to commencement of activity requiring permission	SAHRA or ECPHRA
	<b>Water Use Licenses (or permissible uses) in terms of the NWA</b>			
4.1.2.5	Section 21 of the National Water Act (No. 36 of 1998) recognises water uses that are to be licensed (unless these are existing lawful uses, permissible in terms of Schedule 1, or permissible in terms of a General Authorisation) before they may commence. An integrated Water Use License Application will be required for the following water uses listed in Section 21: a, b, c, g and i.	Proponent to engage with Aquatic Specialist	This application will only be submitted if the project is awarded preferred bidder status in terms of the REIPPPP.	DWS
	<b>License/permits for Mining in terms of the MPRDA</b>			
4.1.2.6	Mining activities such as sand mining, borrowpits and quarries may require permits or licenses from the Department of Mineral Resources in terms of the Mineral and Petroleum Resources Development Act (No. 28 of 2002) before they may commence.	Proponent to engage with Environmental Consultant	Prior to commencement of activity requiring permission	DMR

### 4.1.3 Right to land and access acquisition

These measures will ensure good relationships with landowners and occupiers of land:

Item	Requirement	Responsibility	Implementation Timeframe	Monitoring
4.1.3.1	All land negotiations for the development sites are to be resolved prior to layout designs being finalised.	Proponent	Detailed Design	Relevant Competent Authority
4.1.3.2	Written consent is to be obtained for the use (access or occupation) of private land outside of the approved development sites.	Proponent	Prior to any activities commencing on the land in question.	Relevant Competent Authority

## 4.2 DETAILED DESIGN PHASE CONSIDERATIONS

### 4.2.1 Environmental sensitivities for pre-construction

These measures will ensure that the requirements of the specialists pertaining to specific environmental sensitivities will be integrated into the design phase:

Item	Requirement	Responsibility	Implementation Timeframe	Monitoring
4.2.1.1	The design site layout <sup>4</sup> (the turbine positions, the servitudes, the locations of the power line infrastructure, buildings and access roads (temporary or permanent)) is to accommodate: <ul style="list-style-type: none"> <li>The sensitive areas and associated buffer requirements identified by the Specialists in the Environmental Impact Assessment Process.</li> <li>Any landowner requirements that are already known.</li> </ul>	Engineer	Detailed design	DEA
4.2.1.2	The expertise of a Terrestrial Ecologist, an Aquatic Ecologist, an Archaeologist and an Avifaunal Specialist are to be enlisted to conduct a post-authorisation walkthrough with the design engineers as a micrositing exercise.	Proponent to engage with relevant specialist	Detailed design	DEA
4.2.1.3	Final adjustments to the layout shall be made once the specialist micrositing recommendations from the walkthrough process have been provided. Any No-Go Areas (areas that shall be excluded from any construction activity or general access by the construction team) within the development sites or servitudes shall be clearly indicated on maps and included with the micrositing reports or attached to this EMPr.	Engineer	Detailed design	DEA
	<b><i>Terrestrial Ecology</i></b>			
4.2.1.4	The Terrestrial Ecologist shall undertake a pre-construction walkthrough to further refine the layout and reduce impacts on the Species of Conservation Concern through micrositing of the turbines and access roads.	Terrestrial Ecologist	Detailed Design	DEA
4.2.1.5	Identified areas of high fauna importance at the design stage (as achieved in the current layout) are to be avoided.	Engineer	Detailed design	DEA
4.2.1.6	The design of roads and other infrastructure is to consider faunal impacts and allow fauna to pass through or underneath these features wherever possible.	Engineer	Detailed design	DEA
4.2.1.7	The electrical fencing shall be designed to have a 20 cm gap off the ground. This is to reduce impact to tortoises that can become stuck against such fences and be electrocuted to death.	Engineer	Detailed design	DEA

<sup>4</sup> The site layout submitted for Environmental Authorisation already accommodates the sensitive sites, buffer requirements and known landowner requirements.

	<b>Aquatic Ecology</b>			
4.2.1.8	The Aquatic Ecologist shall undertake a final pre-construction walkthrough as part of a plant search and rescue plan, with the appropriate permits in place.	Aquatic Ecologist	Pre-construction	DEA
4.2.1.9	The Aquatic Ecologist shall undertake the post-authorisation walkthrough to assist in developing a wetland rehabilitation and monitoring plan, and potentially updating a stormwater management plan.	Aquatic Ecologist	Detailed Design	DEA
4.2.1.10	Where any road crossings will be upgraded, detailed design should take cognisance of the following: <ul style="list-style-type: none"> <li>All pipe culverts shall be removed and replaced with suitably sized box culverts, where road levels are raised.</li> <li>If any of the delineated wetlands occur within 50 m of the existing crossings, then a detailed monitoring plan must be developed.</li> </ul>	Engineer & Aquatic Ecologist	Detailed Design	DEA
4.2.1.11	Effective stormwater management must include effective stabilisation (e.g. gabions and Reno mattresses) and the re-vegetation of any disturbed riverbanks.			
	<b>Bats</b>			
4.2.1.12	Detailed design shall prescribe: <ul style="list-style-type: none"> <li>Lights with low sensitivity motion sensors, that can switch off automatically when no persons are nearby, to prevent the creation of regular insect gathering pools that would attract bats.</li> <li>Lights that are down hooded.</li> </ul>	Engineer	Detailed design	DEA
	<b>Avifauna</b>			
4.2.1.13	The turbine layout shall avoid sensitive bird habitats such as wetlands and dams (this mitigation measure was adopted at screening phase and implemented in the initial turbine layout)	Engineer	Detailed design	DEA
4.2.1.14	An avifaunal walkthrough shall be conducted to: <ul style="list-style-type: none"> <li>Confirm final turbine layout,</li> <li>Identify any new sensitive species breeding sites,</li> <li>Identify any sensitivities that may arise between environmental authorisation and the construction phase.</li> </ul>	Avifauna Specialist	Pre-construction	DEA
4.2.1.15	Monitoring of breeding status of Martial Eagles shall be conducted in all breeding seasons prior to and during construction.	Avifauna Specialist	Pre-construction & construction	DEA
4.2.1.16	Pylons or poles shall be designed according to Eskom approved bird friendly designs to ensure that perching large birds cannot be electrocuted.	Engineer	Design Phase	DEA
4.2.1.17	Overhead conductors or earth wires shall be designed to be fitted with an Eskom approved anti bird collision line marking device to make cables more visible to birds in flight and reduce the likelihood of collisions.	Engineer	Design Phase	DEA

4.2.1.18	Provision for a mitigation contingency budget for the operational phase should be made for the potential avifaunal impacts that may arise during operation.	Proponent	Design Phase	DEA
	<b>Agriculture</b>			
4.2.1.19	Detailed design shall prescribe cattle grids where necessary to mitigate risks of gates being left open.	Engineer	Design Phase	DEA
	<b>Archaeology</b>			
4.2.1.20	Before the potential three sections of 33kV overhead line are constructed, a final micro-siting walkthrough shall be undertaken to ensure that any unforeseen impacts due to this line are mitigated.	Archaeologist	Pre-construction	DEA
	<b>Visual</b>			
4.2.1.21	Where substations are to be located near main roads or district roads, and where highly visible from these roads, then the design is to include screening such as earth berms or landscaping (tree or hedge planting).	Engineer	Design Phase	DEA
4.2.1.22	Design consideration for lighting choices on turbines and facilities include: <ul style="list-style-type: none"> <li>• Navigation lights to be kept to the minimum allowed by the Civil Aviation Authority.</li> <li>• Security and area lighting at substations and Operation and Maintenance buildings to be fitted with reflectors to minimize light spillage.</li> <li>• Low-level lights to be used in preference to lamp standards.</li> </ul>	Engineer	Design Phase	DEA
4.2.1.23	Design considerations for signage/billboards include: <ul style="list-style-type: none"> <li>• External signage to be kept to a minimum and billboard type signs avoided.</li> </ul>	Engineer	Design Phase	DEA
	<b>Traffic</b>			
4.2.1.24	The Traffic Management Plan needs to be updated to: <ul style="list-style-type: none"> <li>• Clearly define route to site for specific vehicles needed to transport equipment and materials; and</li> <li>• Schedule delivery to avoid local congestion.</li> </ul>	Traffic Engineer	Design Phase	DEA
	<b>Socio-Economic</b>			
4.2.1.25	The Proponent shall engage with local authorities and business organisations to investigate the possibility of procuring construction materials, goods and products from local suppliers where feasible.	Proponent	Design Phase	TBC
4.2.1.26	Organise local community meetings to advise the local labour force about the project that is planned to be established and the jobs that can potentially be applied for.	Contractor	Pre-construction Phase	TBC
4.2.1.27	Establish a local skills desk (in Humansdorp) to determine the potential skills that could be sourced in the area.	Contractor	Pre-construction Phase	TBC
4.2.1.28	Engage with relevant local authorities (and provincial if necessary) 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.	Proponent	Design Phase	TBC

## 4.2.2 Management plans

These measures will ensure that the specific specialist requirements resulting from the micro-siting exercise will be captured:

Item	Requirement	Responsibility	Implementation Timeframe	Monitoring
4.2.2.1	<p>The following Management Plans are included as Appendix 5 of this report:</p> <ul style="list-style-type: none"> <li>• Plant Rescue and Protection Plan</li> <li>• Listed Invasive Alien Plant Species Management Plan</li> <li>• Avifauna and Bat Monitoring and Management Plan</li> <li>• Revegetation and Habitat Rehabilitation Plan</li> <li>• Open Space Management Plan</li> <li>• Traffic Management Plan</li> <li>• Stormwater Management Plan</li> <li>• A Fire Management Plan</li> <li>• An Erosion Management Plan</li> </ul>	Proponent to engage with relevant specialists	Pre-construction and Construction Phase	DEA
4.2.2.2	<p>The following Management Plans are to be developed and finalised post-authorisation:</p> <ul style="list-style-type: none"> <li>• Transportation Management Plan<sup>5</sup></li> <li>• Wetland Rehabilitation and Monitoring Plan<sup>6</sup></li> </ul>	Proponent to engage with relevant specialists	Pre-construction and Construction Phase	DEA

<sup>5</sup> At this point in time, it is not feasible to develop a Transportation Management Plan as the specific details required to develop it are not yet available. The contractor for the transport of components will only be appointed should the project proceed to construction. As such, each contractor has their own set of requirements for transport and in particular the technical considerations around road conditions and turbine specifications at the time of construction will need to be considered and addressed. As actual construction of this project remains uncertain and if it goes ahead it may only in 5 years' time, the TMP can only be produced if and when the technical considerations have been finalised prior to the construction. The Transport Management Plan will however comply with the relevant requirements as specified in the Traffic Impact Assessment that forms part of the suite of specialist studies for this project.

<sup>6</sup> The Wetland Rehabilitation and Monitoring Plan can only be finalised once the relevant specialist has undertaken the post-authorisation site walkdown.

### 4.2.3 Tender considerations

These measures will ensure that the specialist requirements for tender are included:

Item	Requirement	Responsibility	Implementation Timeframe	Monitoring
4.2.3.1	The approved construction footprint shall be issued as a formal drawing, that would require a request for revision with substantial motivation should a larger or amended construction footprint be required.	Engineer	Tender preparation	DEA
4.2.3.2	The recruitment selection process shall seek to promote gender equality.	Engineer	Tender preparation	DEA
4.2.3.3	The terms of Contract shall include mechanisms for disciplinary action for environmental transgressions (such as the issuing penalties and fines), and the recovery of any monies due (including for any remedial costs where these were born by a third party).	Engineer	Tender preparation	DEA
4.2.3.4	The terms of Contract shall include for the liabilities in terms property damage or fire-fighting costs of runaway fire proven to be caused by a member of the Contractor's team or construction activities.	Engineer	Tender preparation	N/A

## 5 CONSTRUCTION PHASE

### 5.1 CODE OF CONDUCT

#### 5.1.1 Personal conduct

These measures will ensure that the personal conduct of all staff is environmentally and socially considerate:

Item	Requirement	Responsibility	Implementation Timeframe	Monitoring
5.1.1.1	The Code of Conduct and the conditions of the EMPr apply to all staff involved in the project, including (but not limited to) the Engineer and Contract Manager, Contractor(s) and staff (including Sub Contractors and staff), EAPs, Environmental Specialists, and other service / product providers (including the survey teams, material delivery teams, geotechnical or other specialist teams).	Proponent	Project life cycle	DEA
5.1.1.2	All staff must wear the appropriate safety gear, utilize the appropriate safety equipment, and adhere to the appropriate safety laws & standards (including the Occupational Health and Safety Act, Act No 85 of 1993 (OHSA).	Contractor	Construction phase	ECO - as per Schedule
5.1.1.3	Teams working outside of the development sites (including the contractor's camp/s) or requiring access to private properties are to carry identification on their persons that includes their name and company of employ, with reference to the project. Similarly, such information should be displayed on vehicle dashboards / exteriors.	Contractor	Construction phase	ECO - as per Schedule
5.1.1.4	No firearms or weapons of any description are to be allowed on site, unless required by security personnel.	Contractor	Construction phase	ECO - as per Schedule
5.1.1.5	Private property access is only permitted on previous agreement with the affected landowner or will be considered trespassing.	Contractor	Construction phase	ECO - as per Schedule
5.1.1.6	No swimming, bathing, or washing activities may occur in any water source / body on or adjacent to the development sites other than those supplied specifically for such use.	Contractor	Construction phase	ECO - as per Schedule
5.1.1.7	Ablution activities may only occur in designated facilities.	Contractor	Construction phase	ECO - as per Schedule
5.1.1.8	All staff are to make use of the facilities provided for them, as opposed to ad-hoc alternatives, (e.g. fires for cooking, use of the surrounding areas / bush as a toilet).	Contractor	Construction phase	ECO - as per Schedule
5.1.1.9	Unauthorised access inside No-Go areas is prohibited.	Contractor	Construction phase	ECO - as per Schedule



## 5.1.2 Environmental care

These measures will ensure that all staff exercise environmental care:

Item	Requirement	Responsibility	Implementation Timeframe	Monitoring
	<b><i>Biodiversity Care</i></b>			
5.1.2.1	Any unauthorised disturbance or damage to open space areas or flora and fauna outside of the development sites (including the contractor's camp/s) is prohibited and may be subject to reinstatement or rehabilitation to the culprit's cost.	Contractor	Construction phase	ECO - as per Schedule
5.1.2.2	Hunting or snaring any animal (mammal, reptile, amphibian, bird, insect or fish) is prohibited. Capturing any animal is prohibited, unless on instruction from the ECO where the animal is at risk from the development activities. No animal may be wilfully harmed unless it threatens the life of a person, or the person is in imminent danger.	Contractor	Construction phase	ECO - as per Schedule
5.1.2.3	Collecting, cutting, clearing, burning or otherwise disturbing plant material not designated for clearing or rescue is prohibited.	Contractor	Construction phase	ECO - as per Schedule
5.1.2.4	Any person found to be deliberately or negligently polluting any part of the development sites (including the contractor's camp/s), or adjacent areas will face disciplinary action.	Contractor	Construction phase	ECO - as per Schedule
5.1.2.5	The unauthorised abstraction / use of water from any water sources / bodies on the site is prohibited.	Contractor	Construction phase	ECO - as per Schedule
5.1.2.6	The use of any natural water sources (e.g. springs, streams, open water bodies) for the purposes of bathing, or the washing of machinery, equipment or clothes is prohibited.	Contractor	Construction phase	ECO - as per Schedule
5.1.2.7	The harvesting of firewood or any other natural resources from the development site (including the contractor's camp/s) or adjacent areas is prohibited.	Contractor	Construction phase	ECO - as per Schedule
5.1.2.8	The removal of boulders, rocks, pebbles, gravel, sand or any other material not designated for removal is prohibited.	Contractor	Construction phase	ECO - as per Schedule
	<b><i>Heritage Care</i></b>			
5.1.2.9	Any persons found to be deliberately or negligently defacing, damaging, painting or marking natural features such as rock formations (with the exception of approved marking exercises during rescue operations) will face disciplinary action, and restoration or compensation as determined by the heritage authority may apply.	Contractor	Construction phase	ECO - as per Schedule
5.1.2.10	Any persons found to be deliberately or negligently defacing, damaging, destroying or altering a heritage resource as depicted in the sensitivity maps will be subject to disciplinary action, and restoration or compensation as determined by the heritage authority may apply.	Contractor	Construction phase	ECO - as per Schedule

## 5.2 SPECIALIST REQUIREMENTS

### 5.2.1 Environmental sensitivities for construction

Item	Requirement	Responsibility	Implementation Timeframe	Monitoring
	<b>Terrestrial Ecology</b>			
5.2.1.1	A search and rescue operation for reptiles and other vulnerable species shall be conducted before areas of intact vegetation are cleared.	Terrestrial Ecologist	Pre-clearing	ECO – as per schedule
5.2.1.2	All vehicles accessing the site should adhere to low speed limits (40km/h max) to avoid collision with susceptible species such as snakes and tortoises.	Contractor	Construction Phase	ECO – as per schedule
5.2.1.3	No excavated holes or trenches shall be left open for extended periods as fauna may fall in and become trapped.	Contractor	Construction Phase	ECO – as per schedule
	<b>Aquatic Ecology</b>			
5.2.1.4	All alien plant re-growth, which is currently high within the greater region shall be monitored and should it occur, these plants should be eradicated within the project footprint and especially in areas near the proposed water crossings.	Contractor	Construction Phase	ECO – as per schedule
5.2.1.5	Where any road crossings will be upgraded, construction shall take cognisance of the following: <ul style="list-style-type: none"> <li>River levels, regardless of the current state of the river / watercourse shall be reinstated thus preventing any impoundments from being formed. The related designs must be assessed by an aquatic specialist during a post-authorisation walkdown, prior to commencement of the construction phase.</li> <li>Approach road embankments especially where large cut and fill areas will be required shall be rehabilitated during the construction process, to minimise erosion.</li> <li>Suitable stormwater management systems shall be installed and monitored during the first few months of use. Any erosion / sedimentation must be prevented.</li> </ul>	Contractor	Construction Phase	ECO – as per schedule
5.2.1.6	The appropriate permits from DEDEAT and DAFF shall be obtained prior to disturbing/removing any protected plants.	Contractor	Construction Phase	ECO – as per schedule
5.2.1.7	Mechanical plant and bowsers shall not be refuelled or serviced within or directly adjacent to any channel.	Contractor	Construction Phase	ECO – as per schedule
5.2.1.8	All construction camps, lay down areas, batching plants or areas and any stores shall be more than 50 m from any demarcated watercourses.	Contractor	Construction Phase	ECO – as per schedule
5.2.1.9	Emergency plans shall include for spillages onto road surfaces and water courses.	Contractor	Construction Phase	ECO – as per schedule

5.2.1.10	No stockpiling should take place within a watercourse.	Contractor	Construction Phase	ECO – as per schedule
	<b>Bats</b>			
5.2.1.11	Rehabilitate cleared vegetation where possible at areas such as temporary laydown areas.	Contractor	Construction Phase	ECO – as per schedule
	<b>Avifauna</b>			
5.2.1.12	Monitoring of breeding status of Martial Eagles shall be conducted in all breeding seasons prior to and during construction.	Avifauna Specialist	Pre-construction & Construction Phases	DEA
5.2.1.13	Overhead conductors or earth wires shall be fitted with an Eskom approved anti bird collision line marking device, as per design, to make cables more visible to birds in flight and reduce the likelihood of collisions.	Contractor	Construction Phase	DEA
	<b>Palaeontology</b>			
5.2.1.14	The recording and sampling of significant fossil discoveries shall be undertaken by a professional palaeontologist, and any potential fossil finds shall be safeguarded and reported to ECPHRA.	Contractor	Construction Phase	ECO – as per schedule
	<b>Archaeology</b>			
5.2.1.15	<p>The Stone Age quarry site at IE8 (34°8'59" S and 24°39'36" E) is avoided by the layout of the project, but as it is in close proximity to development it shall be made a No-Go Areas, and shall be protected from damage during the construction phase of the project:</p> <ul style="list-style-type: none"> <li>The site shall be enclosed with a temporary fence for the construction phase of development. Fencing should be a temporary standard 4 strand 1.2 m cattle fence.</li> <li>Large clear 'No-Go Area' signs shall be attached from the top strand of the fence at intervals of every 15 m.</li> </ul> <p>These measures must be in place prior to the construction phase of the wind farm development. The temporary fencing erected around the No-Go Area IE8 ((34°8'59" S and 24°39'36" E) shall be removed after construction. It is recommended that no signage or fencing is used during the operational phase as this may attract unwanted attention and possible damage to the archaeological resource.</p>	Contractor	Prior to construction commencing	ECO – as per schedule
5.2.1.16	A suitably qualified and accredited professional archaeologist shall be appointed to undertake archaeological monitoring during the construction phase, including the fencing of any No-Go areas prior to construction.	Proponent	Construction Phase	DEA/ECPHRA
5.2.1.17	The contractor must supply the appointed archaeologist with the construction programme at least 4 weeks before construction starts to ensure the monitoring can be properly planned.	Contractor	Pre-construction Phase	ECO – as per schedule

5.2.1.18	It is recommended that archaeological monitoring be undertaken by a suitably qualified and accredited professional archaeologist during the construction phase for any construction that takes place in the area south of the white dashed line as indicated in Appendix 2.	Archaeologist	Construction Phase	ECO – as per schedule
	<b>Noise &amp; Shadow Flicker</b>			
5.2.1.19	A proactive warning system shall be established to inform affected community members of the planned construction activities with an estimation of the commencement date and duration of each activity.	Contractor	Construction Phase	ECO – as per schedule
5.2.1.20	<b>Visual</b>			
5.2.1.21	Construction camps and storage/stockpile areas to be located in unobtrusive positions in the landscape, away from main roads, farmsteads and scenic areas, or alternatively screening measures utilised, as implemented in the current layout.	Contractor	Construction Phase	ECO – as per schedule
5.2.1.22	Construction camps to be clearly delineated and limited in size to only that which is essential.	Contractor	Construction Phase	ECO – as per schedule
	<b>Traffic</b>			
5.2.1.23	Create local WhatsApp Groups: <ul style="list-style-type: none"> <li>Post notices of road conditions and propose alternatives.</li> </ul> Notify users of expected deliveries and propose alternative routes.	Contractor	Construction Phase	ECO – as per schedule
5.2.1.24	Proponent to contribute to the maintenance of the public roads in the area during construction phases of the development.	Proponent	Construction Phase	DEA
5.2.1.25	Upgrade unpaved roads to suitable condition for proposed construction vehicles.	Contractor	Construction Phase	ECO – as per schedule
5.2.1.26	Post relevant road signage along affected routes.	Contractor	Construction Phase	ECO – as per schedule
5.2.1.27	Provide advance driver training to key personnel, including truck drivers.	Contractor	Construction Phase	ECO – as per schedule
	<b>Socio-Economic</b>			
5.2.1.28	The Proponent shall encourage the main contractors 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.	Proponent	Construction Phase	TBC
5.2.1.29	Recruit local labour as far as feasible.	Contractor	Construction Phase	TBC
5.2.1.30	Employment of labour-intensive methods in construction where feasible.	Contractor	Construction Phase	TBC

5.2.1.31	Sub-contract to local construction companies particularly SMME's and BBBEE compliant and women-owned enterprises where possible.	Contractor	Construction Phase	TBC
5.2.1.32	Use local suppliers where feasible and arrange with the local SMME's to provide transport, catering and other services to the construction crews.	Contractor	Construction Phase	TBC
5.2.1.33	Facilitate knowledge and skills transfer between foreign technical experts and South African professionals during the pre-construction and construction phases.	Contractor	Construction Phase	TBC
5.2.1.34	Set up apprenticeship programmes to build onto existing skill levels or develop new skills amongst construction workers especially those from local communities.	Contractor	Construction Phase	TBC
5.2.1.35	Ensure a community liaison officer is active in the nearby towns and ensure adherence to strict labour recruitment practices that would reduce the desire of potential job seekers to loiter around the properties in the hope of finding temporary employment.	Contractor	Construction Phase	TBC
5.2.1.36	An HIV/AIDS/TB awareness programme for all construction workers shall be implemented at the outset of the construction phase.	Contractor	Construction Phase	ECO- as per schedule

## 5.3 GENERAL REQUIREMENTS

### 5.3.1 No-Go Areas

These measures will ensure that No-Go Areas will be protected:

Item	Requirement	Responsibility	Implementation Timeframe	Monitoring
5.3.1.1	A temporary fence/barricade shall be erected and maintained around the perimeter (including any specified buffers) of No-Go areas.	Contractor	Construction Phase	ECO – as per schedule
5.3.1.2	Development related activities inside No-Go areas shall be prohibited, and access restricted.	Contractor	Construction Phase	ECO – as per schedule

### 5.3.2 Emergency preparedness

These measures will ensure that staff are prepared for and able to respond to emergency situations (as best as possible) to reduce the risk of injury or incident:

Item	Requirement	Responsibility	Implementation Timeframe	Monitoring
	<b><i>Emergency procedures</i></b>			
5.3.2.1	The procedures for dealing with an environmental incident or public complaint as described in Section 3.3 and Section 3.4 shall be communicated to relevant staff. Emergency preparedness shall form part of the Environmental Awareness and Induction Training (Section 3.6).	Contractor	Construction Phase	ECO- as per schedule
5.3.2.2	The Contractor shall determine appropriate procedures in the event of an emergency (e.g. medical emergencies, runaway fires, environmental incidents, site evacuation and staff assembly), and shall submit a Method Statement to the Contract Manager and ECO for approval of the proposed procedures.	Contractor	Method Statement within 14 days of commencement date.	ECO- as per schedule
5.3.2.3	The following contact details shall be clearly displayed at the contractor's camp near a telephone, and provided to relevant staff: <ul style="list-style-type: none"> <li>Emergency contact details for the local hospital, fire brigade, and police department.</li> <li>A list of contact details for the ECO, Contract Manager and relevant authorities.</li> <li>Contact details for the heritage authority (ECPHRA) (in the event that a heritage discovery is made).</li> </ul>	Contractor	Construction Phase	ECO- as per schedule
5.3.2.4	First Aid Kits are to be strategically placed at the site office / camp, laydown areas, and on site where required. All staff are to be made aware of their locations and purposes and trained in their basic use.	Contractor	Construction Phase	ECO- as per schedule

5.3.2.5	Material Safety Data Sheets (MSDSs) shall be readily available on site for all chemicals and hazardous substances housed or used on site. Where possible and available, MSDSs should additionally include information on ecological impacts and measures to minimise negative environmental impacts during accidental releases or escapes.	Contractor	Construction Phase	ECO- as per schedule
5.3.2.6	Evacuation Plans shall: <ul style="list-style-type: none"> <li>• Be appropriately displayed at the Contractor's camp/s showing evacuation routes and assembly points.</li> <li>• Be communicated to all staff as part of the Environmental Awareness and Induction Training.</li> <li>• Include for the contingency plans to evacuate severely injured staff to designated medical facilities.</li> </ul>	Contractor	Construction Phase	ECO- as per schedule
	<b>Fire preparedness</b>			
5.3.2.7	Fire extinguishers and fire-fighting equipment (in terms of the OHSA) are to be strategically placed at the site office / camp, laydown areas, and on site where required. All staff are to be made aware of their locations and purposes and trained in their basic use.	Contractor	Construction Phase	ECO- as per schedule
5.3.2.8	Smoking shall not be permitted in those areas where it is a fire hazard. Such areas shall include fuel storage and refuelling areas, vegetation stockpile areas and any other areas where the vegetation (e.g. fynbos) or other materials are susceptible to the start and rapid spread of fire.	Contractor	Duration of construction	ECO - as per schedule
5.3.2.9	A Fire Officer shall be nominated (the ESO may fulfil this role) to be responsible for developing immediate and appropriate actions in the event of a fire and shall ensure that employees are aware of the procedure to be followed. In the event of a fire, site staff shall first try to contain the fire without posing unnecessary risks to themselves. As soon as it looks as if the fire may get out of control, appropriate emergency personnel shall be dispatched.	Contractor	Duration of construction	ECO - as per schedule

### 5.3.3 Contractor's camp and laydown areas

These measures will ensure that impacts to the environment and neighboring landuses are minimized during site establishment:

Item	Requirement	Responsibility	Implementation Timeframe	Monitoring
5.3.3.1	The Contractor shall determine appropriate locations for the contractor's camp/s and laydown areas for the portion of work in progress and shall submit a Method Statement to the Contract Manager and ECO for approval of the proposed locations and layouts. <ul style="list-style-type: none"> <li>• The location and layout shall be such that visual, dust and noise impacts on sensitive receptors such as adjacent residents / businesses / activities are minimized as far as possible.</li> <li>• These shall be located within the development sites, approved areas or authorised corridors wherever possible, and may not be situated on sensitive areas identified in the environmental assessment or specialist walkthrough exercise.</li> </ul>	Contractor	Method Statement 14 days prior commencement date.	Contract Manager & ECO - as per schedule

	<ul style="list-style-type: none"> <li>Wherever possible, these shall be located on previously disturbed areas.</li> </ul>			
5.3.3.2	<p>The main contractor's camp layout shall make provision for (where applicable):</p> <ul style="list-style-type: none"> <li>Access off the road network and visitor / staff parking facilities.</li> <li>Site office facilities and a structure to shelter security staff.</li> <li>Ablution facilities and a potable water source.</li> <li>Designated cooking areas.</li> <li>Hazardous material / chemical storage and fuel storage.</li> <li>Equipment cleaning areas.</li> <li>Waste storage and wastewater management.</li> <li>Plant parking facilities and a vehicle refuelling/maintenance area/s.</li> <li>Emergency equipment storage areas including fire extinguishers and first aid kits.</li> <li>Laydown areas, batching plant and materials storage.</li> <li>Security fencing.</li> </ul>	Contractor	Construction Phase	Contract Manager & ECO - as per schedule
5.3.3.3	The facilities that require slabbed or bunded surfaces are to be designed to engineering standards of sufficient capacity.	Contractor	Construction Phase	Contract Manager & ECO - as per schedule
5.3.3.4	The disturbance to topsoil shall be minimised, and compaction or removal of topsoil shall be restricted wherever possible (e.g. access routes and parking areas, and activity areas).	Contractor	Construction Phase	ECO – as per schedule
5.3.3.5	Any additional telephone lines, electricity lines, sewer and / or water supply networks are to be approved by the relevant authorities prior to installation if so required by law, even if temporary.	Contractor	Construction Phase	Contract Manager
5.3.3.6	Paved / hardened or dedicated (marked) pathways are to be provided between office facilities / security facilities, high pedestrian and vehicle traffic areas (such as parking areas) to reduce soil erosion.	Contractor	Construction Phase	ECO – as per schedule
5.3.3.7	<p>Should lights be installed at the contractor's camp for security purposes, then:</p> <ul style="list-style-type: none"> <li>Any security lighting installed shall not cause a reasonably avoidable disturbance to other users of the surrounding area.</li> <li>Lighting shall meet the requirements to mitigate impacts to bats as set out in the environmental sensitivities for pre-construction.</li> <li>Lighting installed shall, as far as practically possible, be energy efficient and angled downwards.</li> <li>Lighting shall be turned off when not in use or fitted with movement sensors (where lights only come on when required) or similar.</li> </ul>	Contractor	Construction Phase	ECO – as per schedule
5.3.3.8	<p>Potable water shall be provided for drinking purposes at the main Contractor's camp. Should a potable water supply / container be provided, then:</p> <ul style="list-style-type: none"> <li>It is to be animal and weather proof and sealed / fenced to prevent potential contamination / drowning.</li> </ul>	Contractor	Construction Phase	ECO – as per schedule



5.3.3.9	All cooking shall be done in a designated area of the contractor's camp (preferably on well-maintained gas cookers) with fire extinguishers present.	Contractor	Construction Phase	ECO – as per schedule
5.3.3.10	Temporary fencing shall be installed around the Contractor's camps and designated laydown areas (as required by Contract) with appropriate gates and signage to prevent unauthorised access by the public.	Contractor	Prior to activity commencing and ongoing for duration of activity	ECO - as per schedule
5.3.3.11	The movement of construction workers on and off the site should be closely managed and monitored.	Contractor	Duration of construction	ECO - as per schedule

### 5.3.4 Ablution facilities

These measures will ensure the appropriate maintenance and management of ablation facilities to prevent pollution of the environment, including ground and surface water:

Item	Requirement	Responsibility	Implementation Timeframe	Monitoring
5.3.4.1	<p>The Contractor shall submit a Method Statement for Ablution Facilities, which shall address washing facilities (including methods for managing grey water) and toilets (including the number of, location and method of securing portable/chemical toilets to the ground (if not trailer versions), the proposed service providers and their service schedule).</p> <ul style="list-style-type: none"> <li>A sufficient number of toilets shall be provided for the site staff at a ratio of not less than 1 toilet per 15 people.</li> <li>Toilet facilities shall be located within the contractor's camp and at work areas remote from the camp.</li> </ul>	Contractor	Method Statement 14 days prior to commencement date.	ECO - as per schedule
5.3.4.2	<p>Should portable/chemical toilets be used then these shall be used and maintained in such a way that they do not cause water or other pollution:</p> <ul style="list-style-type: none"> <li>No toilet facilities shall be located closer than 50 m to any water body</li> <li>Toilets shall be adequately secured to the ground to prevent them from toppling due to wind or any other cause.</li> <li>Adequate toilet paper, and hand sanitiser or soap shall be provided.</li> <li>Toilets shall be serviced regularly (as per the service providers recommendations) and care shall be taken to ensure no spillage occurs when the toilets are cleaned or emptied and that the waste contents and grey water are properly stored before removal from site.</li> <li>Certificates of service/disposal by appropriate service providers or at appropriately licensed facilities shall be retained for submission to the ECO.</li> <li>Discharge of waste from toilets into the environment (e.g. burial of ablation waste from toilets) is strictly prohibited.</li> </ul>	Contractor	Duration of construction	ECO - as per schedule
5.3.4.3	Long drops are forbidden. Septic tank systems (if required) are to be designed by qualified professionals and built to specification and include any requirements of a Water Use Authorisation, if applicable.	Contractor	Construction Phase	ECO- as per schedule

5.3.4.4	Any staff wash-up areas or bathing facilities are to drain into the municipal drainage system / septic tank system, or alternative arrangements are to be made for the collection and disposal of runoff from these areas at a suitable facility.	Contractor	Construction Phase	ECO- as per schedule
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### 5.3.5 Protection of public infrastructure and services

These measures will limit and consolidate the impacts of the construction activities on existing infrastructure and services:

Item	Requirement	Responsibility	Implementation Timeframe	Monitoring
5.3.5.1	Should there be plans to affect any public infrastructure, services or servitudes during the construction, then the Contractor shall contact the relevant service authorities to obtain agreement on proposed action.	Contractor	Prior to commencing proposed action	ECO - prior to contractor commencing
5.3.5.2	Any restrictions that are placed on the construction activities or choice of plant when working under or in close proximity to public infrastructure or service servitudes as set by the relevant service authorities shall be adhered to, and measures to protect such infrastructure and services shall be implemented.	Contractor	Duration of construction	ECO - as per schedule
5.3.5.3	Should such public infrastructure or services be damaged in any way, the owner of the infrastructure or the custodian of the service shall be notified and the damage satisfactorily repaired.	Contractor	Within 24 hours of incident	ECO - as per schedule
5.3.5.4	The Contractor shall notify affected parties (e.g. affected adjacent landowners, relevant service providers and/or the affected community) of any planned disruptions to water, electricity, road thoroughfare, or telecommunications.	Contractor	At least 24 hours in advance	ECO - as per schedule
5.3.5.5	In the event of accidental disruptions, the Contractor shall endeavour to advise the affected parties of when the problem is likely to be resolved.	Contractor	As soon as practically possible	ECO - as per schedule

### 5.3.6 Heritage resource protection

These measures will prevent impacts to objects of historical significance or heritage value:

Item	Requirement	Responsibility	Implementation Timeframe	Monitoring
5.3.6.1	The Contractor shall ensure that the Proponent has obtained the requisite permits to destroy/remove any known heritage resources that cannot be conserved prior to any disturbance, damage, destruction, alteration or demolition activities being executed.	Contractor	Prior to commencement of activities	ECO - as per schedule
	<b>New Discoveries</b>			
5.3.6.2	Should a new discovery of possible heritage significance (archaeological sites or remains e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, charcoal and ash concentration, fossils e.g. vertebrate bones and teeth, or petrified logs of fossil wood; or other categories of heritage	Contractor	Duration of construction	ECO - as per schedule

	<p>resources) be made, then:</p> <ul style="list-style-type: none"> <li>All works within the vicinity of any discovery of potential heritage significance shall cease immediately, and the area shall be cordoned off until the necessary remedial steps have been implemented and authorisation has been obtained to resume activities.</li> <li>The ECO and the relevant heritage authority (SAHRA and/or ECPHRA) shall be notified immediately, and arrangements made for the discovery to be examined by an appropriate heritage specialist. The requisite actions emanating from the advice of the heritage authority and specialist shall then be implemented.</li> <li>Reasonable precautions shall be taken to prevent any person from removing or damaging any discovered fossils, coins, articles of value or antiquity, structures and other remains of archaeological/ palaeontological/ historical interest discovered within the site.</li> </ul>			
5.3.6.3	If the newly discovered heritage resources prove to be of archaeological or palaeontological significance, a Phase 2 rescue operation may be required subject to permits issued by SAHRA/ECPHRA.	Proponent to engage relevant specialist	To be determined by relevant specialist	SAHRA/ECPHRA
5.3.6.4	The palaeontologist concerned with any mitigation work will need a valid fossil collection permit from the ECPHRA and any material collected would have to be curated in an approved depository (e.g. museum or university collection). All palaeontological specialist work would have to conform to international best practice for palaeontological fieldwork and the study (e.g. data recording fossil collection and curation, final report) should adhere as far as possible to the minimum standards for Phase 2 palaeontological studies developed by SAHRA (2013).	Proponent to engage relevant specialist	To be determined by relevant specialist	ECPHRA
	<b>Graves/Human Remains</b>			
5.3.6.5	<p>Should a new discovery of human remains/grave be made, then:</p> <ul style="list-style-type: none"> <li>All works within the vicinity of the human remains/grave shall cease immediately, and the area shall be cordoned off until the necessary remedial steps have been implemented and authorisation has been obtained to resume activities.</li> <li>The find may fall into the domain of SAHRA and would need to be reported to them, and will require inspection by a professional archaeologist to undertake mitigation, if needed.</li> <li>The ECO and the Police shall be notified, and arrangements made for the discovery to be examined by an appropriate specialist. The requisite actions emanating from the advice of the Police and specialist shall then be implemented.</li> <li>Graves and burial grounds are the property of the state and may require excavation and curation in an approved institution. Any work associated with the find will also be at the cost of the developer.</li> </ul>	Contractor, & Proponent to engage with relevant specialist	Duration of construction	ECO - as per schedule
5.3.6.6	Any disturbance to a human burial older than 60 years will require a permit in terms of Section 36 (3)(a).	Proponent to engage relevant specialist	To be determined by relevant specialist	ECPHRA

### 5.3.7 Habitat resource protection

These measures will limit impacts on the natural habitats for fauna and flora:

Item	Requirement	Responsibility	Implementation Timeframe	Monitoring
5.3.7.1	Any animal (mammal, reptile, amphibian, bird, insect or fish) found to be trapped within the site or in distress as a result of the site activities shall be appropriately relocated to a suitable site under the guidance of the ECO, relevant specialist if required or relevant authorities.	Contractor	Duration of construction	ECO - as per schedule
5.3.7.2	Habitats and terrestrial or aquatic environments shall not be unnecessarily disturbed or damaged, unless as indicated in the approved development design. Any unauthorised disturbance or damage to habitats, or pollution of aquatic resources by anyone involved in the project shall be subject to reinstatement or rehabilitation to the culprit's cost.	Contractor	Duration of construction	ECO - as per schedule
5.3.7.3	Care shall be exercised during all phases of the work to prevent sediment, debris or pollutants from entering any watercourses or waterbodies.	Contractor	Duration of construction	ECO - as per schedule
5.3.7.4	Should any de-watering activities be required then a Method Statement shall be submitted to the ECO for approval prior to these activities occurring: <ul style="list-style-type: none"> <li>De-watering activities shall not impact negatively on any adjacent water resource.</li> <li>Sediment and pollution control measures shall be implemented.</li> </ul>	Contractor	Prior to commencing activity, if required	ECO - prior to contractor commencing and thereafter as per schedule
5.3.7.5	Alien invasive plant species shall be controlled for the duration of the site activities, and for a stipulated period following rehabilitation. <ul style="list-style-type: none"> <li>Care must be taken to avoid the introduction of alien plant species to the site and surrounding areas.</li> <li>Alien vegetation encroachment onto the site and from the site shall be controlled and prevented.</li> </ul>	Contractor	Duration of construction	ECO - as per schedule

### 5.3.8 Vegetation clearance

These measures will limit the extent of any environmental impacts and minimise unnecessary remediation:

Item	Requirement	Responsibility	Implementation Timeframe	Monitoring
5.3.8.1	Indigenous vegetation on the approved construction site that does not interfere with the construction activities shall be left undisturbed.	Contractor	Duration of construction	ECO - as per schedule
5.3.8.2	Damage shall not be caused to sensitive environmental features outside of the demarcated construction areas, including marked and barricaded heritage resources, protected trees, structures and infrastructure.	Contractor	Duration of construction	ECO - as per schedule
5.3.8.3	Site clearing shall not commence until any required recovery exercises aimed at rescuing and relocating protected plant species has been undertaken by the specialists on the area earmarked for clearing.	Contractor	Once recovery exercise complete	ECO - as per schedule

5.3.8.4	Vegetation clearing shall be kept to that which is absolutely essential, within the footprints of the servitudes, laydown areas, Contractor's camp/s and access roads wherever possible.	Contractor	Construction to commence immediately after clearing	ECO - as per schedule
5.3.8.5	Where possible, areas of phased construction shall be cleared, developed and rehabilitated prior to moving to the next. Soil should be exposed for the minimum time possible once cleared, such that the timing of clearance is coordinated with the onset of construction. This will prevent wind and water erosion.	Contractor	Construction to commence immediately after clearing	ECO - as per schedule
5.3.8.6	Vegetation to be cleared along steep banks should only be removed at the onset of the construction of that area, or immediately prior to landscaping, to reduce soil erosion to the site.	Contractor	At onset of construction or rehabilitation	ECO – as per schedule
5.3.8.7	The clearance of vegetation for a trace line during stringing activities shall be undertaken in accordance with Section 5.5.1.	Contractor	Duration of stringing	ECO – as per schedule
5.3.8.8	Watercourses and drainage lines shall be kept free of felled trees or vegetation cuttings and debris. The integrity of riverbanks shall be maintained wherever possible by leaving the soil and roots undisturbed by clearing activities (i.e. trimming or slashing/cutting rather than total vegetation removal).	Contractor	Duration of construction	ECO - as per schedule
5.3.8.9	The disposal of vegetation by burying or burning is prohibited in terms of national legislation.	Contractor	Duration of construction	ECO - as per schedule
5.3.8.10	Cleared vegetation that is not appropriate for shredding/mulching/chipping, and/or reuse on site shall be disposed of at licensed municipal garden refuse sites.	Contractor	Duration of construction	ECO - as per schedule

### 5.3.9 Hazardous substances and hydrocarbon management

These measures will manage the risk of hydrocarbon leaks and spills as well as the associated risk of pollution:

Item	Requirement	Responsibility	Implementation Timeframe	Monitoring
5.3.9.1	The Contractor shall submit a Method Statement to the Contract Manager and ECO detailing the Hazardous Chemical Substances (as defined in the Regulations for Hazardous Chemical Substances in GN 1179 (25 August 1995)), hydrocarbon substances or dangerous goods to be used, together with the storage, handling and disposal procedures of the materials.	Contractor	Method Statement 14 calendar days prior to commencement date.	ECO – as per schedule
	<b><i>Hazardous Chemical Substances and dangerous goods</i></b>			
5.3.9.2	The relevant Material Safety Data Sheets (MSDSs) for all Hazardous Chemical Substances on site shall be readily available. Procedures detailed in the MSDSs shall be followed in the event of an emergency situation.	Contractor	Duration of construction	ECO - as per schedule
5.3.9.3	If potentially Hazardous Chemical Substances are to be stored on site, then:	Contractor	Duration of	ECO - as per

	<ul style="list-style-type: none"> <li>Hazardous Chemical Substances shall be stored in appropriate containers which are clearly labelled and sealed.</li> <li>Hazardous Chemical Substance containers shall be situated on a smooth impermeable surface (concrete or 250 micrometre (µm) plastic (plastic must have a minimum of a 5 cm layer of sand on top to prevent damage and perishing)) within an earth bund. The impermeable lining shall extend to the crest of the bund and the volume inside the bund shall be 120% of the total capacity of all the storage tanks/bowsers (110% statutory requirement plus allowance for rainfall).</li> <li>Access to Hazardous Chemical Substance storage areas shall be restricted, and the areas secured with requisite warning/safety signage conforming to the requirement of SANS 1186 on display.</li> <li>Disposal of these substances shall be in accordance with Section 5.3.15.</li> <li>Rainwater that collects in bunded areas shall be promptly removed and dealt with as water containing waste.</li> </ul>		construction	schedule
5.3.9.4	All staff working with Hazardous Chemical Substances shall be trained in the safe use of the substance in accordance with the MSDS.	Contractor	Prior to use	ECO – as per schedule
	<b>Hydrocarbons</b>			
5.3.9.5	All necessary approvals with respect to fuel storage and dispensing shall be obtained from the appropriate authorities.	Contractor	Prior to commencing	ECO - prior to contractor commencing
5.3.9.6	Should fuel (petrol and diesel) be stored on-site, then fuel storage areas within the contractor's camp shall be identified and designated to this purpose: <ul style="list-style-type: none"> <li>The designated area shall be located in a portion of the site where it is unlikely to pose a significant risk in terms of water pollution or traffic safety.</li> <li>Warning/safety signage conforming to the requirement of SANS 1186 shall be prominently displayed in and around the fuel storage area.</li> </ul>	Contractor	Prior to site establishment	ECO - prior to site establishment
5.3.9.7	Fuel storage management shall ensure limited risk to the environment: <ul style="list-style-type: none"> <li>All liquid fuels and oils shall be stored in tanks with lids, which are kept firmly shut and adequately secured. The capacity of the tank shall be clearly displayed, and the product contained within the tank clearly identified using the emergency information system detailed in SANS 0232 part 1.</li> <li>Fuel storage tanks shall have a capacity not exceeding 9000 litres and shall be kept on site only for as long as fuel is needed for construction activities, on completion of which they shall be removed.</li> <li>Fuel shall be stored in drums or bowsers situated on a smooth impermeable surface (concrete or 250 micrometre (µm) plastic (plastic must have a minimum of a 5 cm layer of sand on top to prevent damage and perishing)) within an earth bund. The impermeable lining shall extend to the crest of the bund and the volume inside the bund shall be 120% of the total capacity of all the storage tanks/bowsers (110% statutory requirement plus allowance for rainfall).</li> <li>Only empty externally clean drums may be stored on the bare ground. Empty and externally dirty tanks shall be sealed and stored on an area where the ground has been made impermeable.</li> </ul>	Contractor	Duration of construction	ECO - as per schedule

	<ul style="list-style-type: none"> <li>• There shall be adequate fire-fighting equipment at the fuel storage area.</li> <li>• Rainwater that collects in bunded areas shall be promptly removed and dealt with as water containing waste.</li> </ul>			
5.3.9.8	<p>Should regular refuelling on site be necessary, then provision shall be made for a dedicated refuelling station at the fuel storage area:</p> <ul style="list-style-type: none"> <li>• The impermeable, bunded fuel storage area shall also accommodate refuelling activities.</li> <li>• The proper dispensing equipment shall be used, and the drum shall not be tipped in order to dispense fuel.</li> <li>• The dispensing mechanism of the fuel storage drum shall be stored in a waterproof container when not in use.</li> <li>• A supply of absorbent material (e.g. Spill Sorb or Enretech #1 powder or equivalent) shall be readily available to absorb, break down and encapsulate minor hydrocarbon spillage. The quantity of such material shall be able to handle a minimum of 200 litres of hydrocarbon liquid spill per incident</li> <li>• There shall be adequate fire-fighting equipment at the refuelling area.</li> </ul>	Contractor	Duration of construction	ECO - as per schedule
5.3.9.9	Where refuelling away from the dedicated refuelling station is required, a mobile refuelling unit shall be used and appropriate and adequate ground-protection such as drip trays used.	Contractor	Duration of construction	ECO - as per schedule
5.3.9.10	Pollutants, or water contaminated with any pollutants (e.g. detergent, cement, fuels and oils) shall be disposed of in accordance with Section 5.3.15.	Contractor	Duration of construction	ECO - as per schedule
	<b>Bitumen</b>			
5.3.9.11	Bitumen drums/products, if stored on site, shall be stored with an appropriate base, bunding and sump.	Contractor	Duration of construction	ECO - as per schedule
5.3.9.12	Rainwater that collects in bunded areas shall be promptly removed and dealt with as water containing waste.	Contractor	Duration of construction	ECO - as per schedule
5.3.9.13	When heating bitumen products, the cognisance shall be taken of appropriate fire risk controls.	Contractor	Duration of construction	ECO - as per schedule
	<b>Spills</b>			
5.3.9.14	<p>The Contractor shall submit a Method Statement to the Contract Manager and ECO for approval of the procedure for dealing with an accidental hydrocarbon spill:</p> <ul style="list-style-type: none"> <li>• Any single spill in excess of 200l shall be reported to the Department of Water and Sanitation (DWS), and the Proponent.</li> <li>• The responsible operator shall have the required training to use the spill kit, or to contain the spill.</li> <li>• The activity causing the spill is to cease, and the spill is to be contained using a spill kit, sand berms, sandbags, sawdust, absorbent materials or similar.</li> <li>• Should any soil become contaminated by oil or fuel spills then the soil shall be removed.</li> <li>• Contaminated soil and material shall be stored in bags or sealed and labelled drums in the designated hazardous waste area of the site and disposed of in accordance with Section 5.3.15.</li> </ul>	Contractor	Method Statement 14 days prior to commencement date.	Contract Manager & ECO - as per schedule

	<ul style="list-style-type: none"> <li>Any contaminated soil that cannot be removed is to be treated in situ as determined by the ECO.</li> </ul>			
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### 5.3.10 Cement and batching plants

These measures will ensure the appropriate management of materials to reduce pollution to the environment:

Item	Requirement	Responsibility	Implementation Timeframe	Monitoring
5.3.10.1	Concrete mixing shall be carried out on an impermeable hardened surface (e.g. boards, or a designated bunded area with an impermeable surface).	Contractor	Duration of construction	ECO - as per schedule
5.3.10.2	Cement powder has a high pH, and spillage of cement powder and concrete slurry can affect soil and water pH. Spillage on permeable surfaces shall be prevented, and cement laden water/runoff shall be collected and disposed of as water containing waste.	Contractor	Duration of construction	ECO - as per schedule
5.3.10.3	A washout facility utilising shall be provided for washing concrete mixing equipment, should cement mixing be required.	Contractor	Duration of construction	ECO - as per schedule
5.3.10.4	Bagged cement shall be stored at an appropriate facility, and empty cement bags shall be soundly secured with adequate binding material should these be stored on site.	Contractor	Duration of construction	ECO - as per schedule
5.3.10.5	Hardened concrete from the concrete mixer or washout facility shall be reused or disposed of as builder's rubble at an appropriately licensed spoil facility.	Contractor	Duration of construction	ECO - as per schedule
5.3.10.6	Where 'readymix' concrete is used, delivery vehicle shall not wash chutes onsite, unless at a designated area where such water can be collected and disposed of as water containing waste. Similarly drum wash shall not be disposed of onsite unless into a contaminated water pond/facility. Any spillage from 'readymix' delivery shall be immediately collected and disposed of as builder's waste as per 5.2.10.5 above	Contractor	Duration of construction	ECO - as per schedule

### 5.3.11 Material and stockpile management

These measures will consolidate areas of impact, preserve stockpiled material and ensure the appropriate management of materials to reduce pollution to the environment:

Item	Requirement	Responsibility	Implementation Timeframe	Monitoring
	<b><i>Materials in transit</i></b>			
5.3.11.1	Delivery drivers shall be informed of all delivery procedures and restrictions (including "no go" areas) and shall be supervised during offloading by someone with an adequate understanding of the relevant requirements of the EMPr.	Contractor	Duration of construction	ECO - as per schedule
5.3.11.2	Materials in transit shall be appropriately secured to ensure safe passage between destinations: <ul style="list-style-type: none"> <li>Loads, including but not limited to, sand, stone chip, fine vegetation, refuse, paper and cement, shall have appropriate cover to prevent them spilling from the vehicle during transit.</li> </ul>	Contractor	Duration of construction	ECO - as per schedule



	<ul style="list-style-type: none"> <li>The Contractor shall be responsible for any clean up resulting from the failure by employees or suppliers to properly secure transported materials.</li> </ul>			
5.3.11.3	All manufactured and or imported materials shall, where reasonably possible, be stored within the contractor's camp and designated laydown areas and, where required, out of the rain.	Contractor	Duration of construction	ECO - as per schedule
	<b>Stockpile management</b>			
5.3.11.4	<p>Stockpiling areas shall be located close to the working area(s) to minimise disturbance to the environment and to avoid modification of drainage patterns.</p> <ul style="list-style-type: none"> <li>Method Statements are required for the location and method of protection of stockpiled materials stored outside of the contractor's camp or designated laydown areas, together with the proposed method of rehabilitating these areas.</li> </ul>	Contractor	Method Statement 14 days prior to commencement of activity	ECO – as per schedule
5.3.11.5	Care shall be taken to ensure that the location of stockpiling areas will not cause damming of water or runoff, nor expose the stockpiled material to extreme erosive elements.	Contractor	Duration of construction	ECO - as per schedule
5.3.11.6	Stockpiles shall not be placed in a manner that obstructs vehicle visibility or drivers' line of site, especially when working near traffic intersections and sharp corners.	Contractor	Duration of construction	ECO – as per schedule
5.3.11.7	<p>Stockpiled material (e.g. topsoil, soil, subsoil, and rocky material) shall be stable and well secured to avoid collapse and possible injury to site workers. Where required, appropriate precautions shall be taken to limit the erosion and compaction of stockpiles:</p> <ul style="list-style-type: none"> <li>Stockpiled material shall not exceed 2 m in height (note: stockpiled topsoil shall be restricted to 1.5 m in height to prevent compaction).</li> <li>Stockpiled material shall be placed to occupy the minimum width compatible with the natural angle of repose of the material (simple dimensions to be provided by the ECO), and measures shall be taken to prevent the material from being spread over too wide a surface.</li> <li>The stockpiles and stockpile areas shall be carefully managed to prevent cross-contamination of stockpile material and to guard against “stockpile creep” (topsoil stockpiles shall be clearly demarcated &amp; be distinguishable from other material stockpiles).</li> <li>Stockpiled material shall be kept clear of weeds and alien invasive vegetation growth by regular weeding, or herbicides if permitted (restrictions on herbicide use for topsoil stockpiles is to the discretion of the ECO).</li> <li>If the stockpiles start to erode significantly or cause dust problems, they shall be covered with suitable erosion protection materials (e.g. hessian or geo-fabric).</li> </ul>	Contractor	Duration of construction	ECO - as per schedule
5.3.11.8	Every effort shall be made to handle topsoil twice only: once to strip and stockpile, and once to replace, level, shape and scarify.	Contractor	Duration of construction	ECO - as per schedule
5.3.11.9	Topsoil stripped from different sites of different soil types shall be stockpiled separately and clearly identified as such for return to area of origin, and every effort shall be made to prevent the mixing of topsoil from different sites of different soil types.	Contractor	Duration of construction	ECO - as per schedule
5.3.11.10	Where practical, stockpiled topsoil shall not be left for more than two to four months before being used for	Contractor	Duration of construction	ECO - as per schedule

	rehabilitation, as longer storage will compromise its fertility. When topsoil must be stored for extended periods of time, topsoil stockpiles shall be protected from erosive forces using a suitable cover: <ul style="list-style-type: none"> <li>• Stockpiled topsoil could be vegetated to reduce the potential for erosion and deterioration in soil quality. Appropriate ground cover could be planted on topsoil stockpiles to prevent surface damage, maintain active populations of beneficial soil microbes, prevent weed infestation and control erosion.</li> <li>• Where wind and water erosion are a particular problem, stockpiled topsoil could be covered in erosion protection materials (e.g. hessian or geo-fabric or similar).</li> <li>• Stockpiled topsoil shall not be covered with any material (e.g. plastic) that may kill seeds or cause it to compost.</li> </ul>			schedule
5.3.11.11	To ensure continued biological activity within topsoil stockpiles, stockpiled topsoil shall not exceed 1.5 m in height and shall not be compacted in any way.	Contractor	Duration of construction	ECO - as per schedule

### 5.3.12 Vehicle/plant and equipment management

These measures will ensure that soil, surface water and groundwater contamination are minimized:

Item	Requirement	Responsibility	Implementation Timeframe	Monitoring
5.3.12.1	All employees must be given the necessary safety ear protection gear when utilising noise-generating equipment or plant. In this regard, the employer is required by law to provide the necessary equipment (i.e. ear protection).	Contractor	Duration of construction	ECO - as per schedule
5.3.12.2	All plant shall be stored within the designated secure area of the contractor's camp, or a secure area equivalent approved by the ECO, when not in use.	Contractor	Duration of construction	ECO - as per schedule
5.3.12.3	All vehicle / plant shall be maintained in good working order, shall adhere to the relevant lighting & noise requirements of the Road Traffic Act (93 of 1996) and SANS 1200A Clause 4.1, and vehicle service histories are to be kept up to date to reduce potential noise and air pollution from vehicle emissions: <ul style="list-style-type: none"> <li>• All vehicles shall be equipped with an appropriate silencer on their exhaust systems.</li> <li>• Mechanical equipment with lower sound power levels shall be selected wherever possible.</li> <li>• Safety measures that generate noise, such as reverse gear alarms on large vehicles, shall be appropriately calibrated or adjusted to minimise noise.</li> <li>• Appropriate directional and intensity settings shall be applied on all hooters and sirens.</li> </ul>	Contractor	Duration of construction	ECO - as per schedule
5.3.12.4	Where possible and practical the maintenance of all vehicles and equipment shall take place in a designated bunded area of the contractor's camp on a sloping hardened surface with a suitable collection sump or suitable oil/water separator. <ul style="list-style-type: none"> <li>• The vicinity of such areas shall be monitored for fuel and oil spills, and these shall be promptly addressed.</li> <li>• Rainwater that collects in bunded areas shall be promptly removed and dealt with as water containing waste in Section 5.3.15.</li> </ul>	Contractor	Duration of construction	ECO - as per schedule

5.3.12.5	All vehicles and plant shall be provided with a suitably sized service pan/drip tray to be used to effectively trap fuel leaks in the event of a breakdown. <ul style="list-style-type: none"> <li>Drip trays shall be provided for all plant including stationary plant (such as compressors) and for “parked” plant (such as scrapers, loaders or any vehicle).</li> </ul>	Contractor	Duration of construction	ECO - as per schedule
5.3.12.6	Vehicles / plant shall not park along the roadside in such a way that they obscure visibility to road users or anyone wishing to leave or enter the contractor’s camp or development sites.	Contractor	Duration of construction	ECO - as per schedule

### 5.3.13 Spoil and trench management

These measures will facilitate appropriate management and use/disposal of spoil material to prevent environmental degradation and dumping:

Item	Requirement	Responsibility	Implementation Timeframe	Monitoring
5.3.13.1	Inert spoil material (material obtained from site that cannot be engineered into the site design as fill or overburden) can be used in the rehabilitation process, either to aid in the final finishing of the site or in providing subsoil cover over which the stockpiled topsoil can be spread.	Contractor	Duration of construction	ECO - as per schedule
5.3.13.2	To consolidate impacts, all spoil material intended for rehabilitation shall be stockpiled within the designated stockpile areas prior to its spoiling or use in rehabilitation.	Contractor	Duration of construction	ECO - as per schedule
5.3.13.3	Any surplus inert spoil that cannot be used elsewhere on site, or for other third party (private/municipal/provincial) purposes, shall be permanently disposed of as builder’s rubble at an appropriately licensed facility.	Contractor	Duration of construction	ECO - as per schedule
5.3.13.4	All trenching activities are to comply with the relevant safety requirements, and unless otherwise stated by the Contract, shall have shoring if the excavations are greater than 1.2 m in depth.	Contractor	Duration of construction	ECO - as per schedule
5.3.13.5	In the event of temporary site closure or shut down, trenches are to be secured to prevent unauthorised access.	Contractor	Duration of construction	ECO - as per schedule
5.3.13.6	Open trenches, excavations and earthworks pose a hazard to both domestic livestock and wild animals: <ul style="list-style-type: none"> <li>Trenches shall be regularly inspected if they can be accessed by animals.</li> <li>Domestic animals or livestock belonging to surrounding communities or landowners shall be kept away from the works, and in this regard appropriate stock-proof fencing may be required around excavations and earthworks.</li> </ul>	Contractor	Duration of construction	ECO - as per schedule

### 5.3.14 Blasting and hotworks

These measures will ensure that impact to the environment and neighbouring landuses are minimized through safe blasting and hotworks practices:

Item	Requirement	Responsibility	Implementation Timeframe	Monitoring
5.3.14.1	Should it be necessary to undertake blasting activities, then adjacent landowners, nearby sensitive receptors, site personnel and the relevant emergency services shall be notified of the location, planned timing and duration of such activities, with sufficient warning to secure livestock/pets.	Contractor	At least 24 hours prior to activity	ECO - as per schedule
5.3.14.2	Blasting activities are to be conducted in accordance with the Explosives Act No. 15 of 2003, the Minerals act, Act No. 50 of 1991 and Regulation 4 of the Explosives Regulations of the Occupational Health and Safety Act No. 85 of 1993). Emergency procedures are to be adhered to.	Contractor	Duration of construction	ECO - as per schedule
5.3.14.3	Blasting activities shall be conducted by a suitably licensed blasting contractor.	Contractor	Duration of construction	ECO - as per schedule
5.3.14.4	Prior to any blasting, the Contractor is to document the status of nearby structures, infrastructure or buildings through photographs or video footage.	Contractor	Prior to activity commencing	ECO - as per schedule
5.3.14.5	All reasonable measures shall be implemented to reduce the noise impacts associated with drilling and blasting to neighbouring residents, landuses, services or infrastructure.	Contractor	Duration of construction	ECO - as per schedule
5.3.14.6	Staff shall wear dust masks during and immediately after any blasting activities (on confirmation with relevant HSE officer).	Contractor	During and immediately after blasting	ECO - as per schedule
5.3.14.7	The Contractor shall ensure that construction related activities that pose a potential fire risk (e.g. hotworks such as welding and grinding) are properly managed and are confined to areas where the risk of fires has been reduced: <ul style="list-style-type: none"> <li>Any activities that involve an open flame or pose a fire risk shall not occur without a fire extinguisher present.</li> <li>Hotworks shall be avoided in high wind conditions, especially in the drier months.</li> </ul>	Contractor	Duration of construction	ECO - as per schedule

### 5.3.15 Waste management

These measures will minimise waste generation and prevent pollution of the environment:

Item	Requirement	Responsibility	Implementation Timeframe	Monitoring
5.3.15.1	In terms of the National Environment Management: Air Quality Act, 39 of 2004, burning is not permitted as a disposal method.	Contractor	At any time	ECO - as per schedule
5.3.15.2	The Contractor shall submit a Method Statement to the Contract Manager and ECO detailing the type of waste anticipated; the storage, handling, reuse, recycling and/or disposal procedures proposed, together	Contractor	Method Statement 14 days prior to	ECO – as per schedule

	with the facilities proposed to receive such waste.		commencement date.	
5.3.15.3	All certificates of disposal or records of handover to appropriately licensed facilities shall be retained, together with records of tonnages per month, and these shall be made available for monthly progress reporting if so required by the ECO, Contract or Contract Manager.	Contractor	Duration of construction	ECO - as per schedule
5.3.15.4	Designated facilities for builder's rubble, hazardous waste, and general waste as provided for in the Contractor's camp/s are to be used for the storage of the appropriate waste products that is weather proof and scavenger proof.	Contractor	Duration of construction	ECO - as per schedule
	<b>General Waste</b>			
5.3.15.5	The quantities of general waste generated on-site shall be minimised wherever possible by reducing, reusing and/or recycling it. <ul style="list-style-type: none"> <li>The nearest municipal/private recycling facilities are to be identified as possible options for receiving recyclable materials</li> <li>Separate receptacles for different types of recyclable/reusable materials are to be provided wherever possible.</li> </ul>	Contractor	Duration of construction	ECO - as per schedule
5.3.15.6	Appropriate general waste (e.g. construction debris, rubble, timber, tins, drums and domestic waste) collection, storage and removal from site shall be implemented. <ul style="list-style-type: none"> <li>Waste shall be removed daily from areas remote from camp and transferred to the appropriate waste storage facility.</li> <li>All non-recyclable litter and refuse shall be disposed of off-site at a licensed landfill facility approved by the Contract Manager and ECO.</li> </ul>	Contractor	Duration of construction	ECO - as per schedule
5.3.15.7	Precautions shall be taken to avoid any waste from spreading on, or from, the site. <ul style="list-style-type: none"> <li>Scavenger and weatherproof bins with lids shall be provided at the contractor's camp, of sufficient number and capacity to store the general domestic waste produced on a daily basis.</li> <li>Bins shall not be allowed to become overfull and shall be emptied regularly at the waste storages areas in the Contractor's camp, or directly transferred to an approved landfill.</li> </ul>	Contractor	Duration of construction	ECO - as per schedule
5.3.15.8	Builder's rubble shall be neatly stockpiled in designated stockpile areas, and shall regularly be removed from site to an appropriately licensed waste disposal facility or reuse/recycling facility approved by the Contract manager or ECO.	Contractor	Duration of construction	ECO - as per schedule
	<b>Hazardous Waste</b>			
5.3.15.9	Should the generation of hazardous waste be anticipated during the site activities, then suitable collection and storage facilities shall be planned, and an area of the Contractor's camp designated for this purpose in accordance with the relevant legislation. <ul style="list-style-type: none"> <li>Hazardous waste shall be stored in sealed and labelled drums, which shall be situated on a smooth impermeable surface (concrete or 250 micrometre (µm) plastic (plastic must have at least a 5 cm layer of sand on top to prevent damage and perishing)) within an earth bund. The impermeable</li> </ul>	Contractor	Duration of construction	ECO - as per schedule

	<p>lining shall extend to the crest of the bund and the volume inside the bund shall be 120% of the total capacity of all the storage tanks/bowsers (110% statutory requirement plus allowance for rainfall).</p> <ul style="list-style-type: none"> <li>• Access to waste storage areas shall be restricted, and the areas secured with requisite warning signage.</li> <li>• Rainwater that collects in bunded areas shall be promptly removed and dealt with as water containing waste.</li> </ul>			
5.3.15.10	<p>Any hazardous waste or contaminated soil shall be disposed of (in accordance with legislation) at a licensed hazardous waste disposal facility, as approved by the Contract Manager and ECO.</p> <ul style="list-style-type: none"> <li>• Hazardous waste is to be contained and transported as required by the relevant legislation.</li> </ul>	Contractor	Duration of construction	ECO - as per schedule
	<b>Liquid waste (and water containing waste)</b>			
5.3.15.11	<p>Paint products, chemical additives and cleaners, such as thinners and turpentine, or water containing waste may not be disposed of into the stormwater system or elsewhere on site.</p>	Contractor	Duration of construction	ECO - as per schedule
5.3.15.12	<p>Should any liquid waste (e.g. spent oils, fuels and hazardous chemicals; cement-laden water or contaminated water from wash slab and repair areas, batching areas, Hazardous Chemical Substance and hydrocarbon storage areas; water containing waste and domestic liquid waste) be generated then the liquid waste shall be stored in sealed and labelled drums or approved containers for such purposes in the designated hazardous waste area of the site until it is disposed of at appropriately licensed wastewater or hazardous waste disposal facilities as approved by the Contract Manager and ECO.</p>	Contractor	Duration of construction	ECO - as per schedule

### 5.3.16 Stormwater and sediment management

These measures will manage contaminated water and prevent polluted runoff from entering watercourses or water bodies:

Item	Requirement	Responsibility	Implementation Timeframe	Monitoring
5.3.16.1	<p>All reasonable measures shall be taken to limit erosion.</p> <ul style="list-style-type: none"> <li>• The most effective way to control erosion is to retain the existing vegetation for as long as possible. Hence, site clearance shall be undertaken in a phased approach wherever possible such that the extent of exposed soils shall be limited to areas of the current construction phase.</li> <li>• Special attention shall be given to ensure the protection of topsoil, overburden, spoil and materials stockpiles from the erosive elements.</li> <li>• Any runnels or erosion channels developed during the construction period or during the vegetation establishment period shall be backfilled and compacted, and the areas restored to a proper condition.</li> <li>• Stabilisation of cleared areas to prevent and control erosion shall be pro-actively managed by the Contractor.</li> <li>• Any relevant requirements stipulated by a Water Use Authorisation must also be implemented, if</li> </ul>	Contractor	Duration of construction	ECO - as per schedule

	applicable.			
5.3.16.2	<p>It may be necessary to design specific protection measures that prevent the concentration of stormwater flows. These could include the construction of permanent or temporary drainage works which shall be designed to avoid scouring and erosion within the channel:</p> <ul style="list-style-type: none"> <li>• <i>Bund (temporary)</i>: This constitutes a ridge of compacted material intended to divert overland sheet flow to a stabilised outlet or channel.</li> <li>• <i>Cut-off drain (permanent)</i>: This constitutes a formal drainage structure to collect stormwater flow and channel into an appropriate discharge point. This shall be constructed on the uphill side of the bund and side drains shall be constructed to convey the flows to flat ground or into an appropriate watercourse.</li> <li>• Where flow velocities cannot be reduced to safe levels, consideration could be given to drainage structures that incorporate erosion resistant materials (e.g. rock).</li> <li>• Any relevant requirements stipulated by a Water Use Authorisation must also be implemented, if applicable.</li> </ul>	Contractor	Duration of construction	ECO - as per schedule
5.3.16.3	<p>Stormwater that has been loaded with suspended solids and silt during the construction phase can be released into watercourses provided all suspended solids have been removed from the water before it is discharged into the environment.</p> <ul style="list-style-type: none"> <li>• Sediment traps, sediment filters and settling out the solids in settlement ponds are possible solutions to preventing sediment from entering adjacent watercourses.</li> <li>• Installing porous barriers to collect silt can dramatically reduce sediment pollution on the opposite sides of the barrier. Applications vary depending on location of the barrier. Silt fences are commonly used as they are cost effective and readily available. They typically will be used as the primary silt collection tool and may be augmented with other sediment barriers.</li> <li>• Straw bales alone are not an acceptable sediment barrier.</li> <li>• All sediment barriers must be inspected and maintained during construction and restoration.</li> <li>• Any relevant requirements stipulated by a Water Use Authorisation must also be implemented, if applicable.</li> </ul>	Contractor	Duration of construction	ECO - as per schedule

## 5.4 SITE ACCESS AND HAUL ROUTES

### 5.4.1 Private properties

These measures will ensure that use of private properties is done with consent and in an environmentally considerate manor:

Item	Requirement	Responsibility	Implementation Timeframe	Monitoring
5.4.1.1	The use (access or occupation) of private properties outside of the approved development sites shall not occur without the Contractor proving that the affected landowner/ authorised representative has provided the Proponent with consent in writing.	Contractor	Prior to use	ECO- as per schedule
5.4.1.2	The Contractor shall agree the detailed access routes and requirements to the development sites, turbine locations and pylon positions with the relevant landowner, specifically adhering to gate management protocols of each landowner/ authorised representative.	Contractor	Prior to access	ECO -as per schedule
5.4.1.3	Access to the development sites, turbine locations and pylon positions shall make use of existing roads, gates and crossings wherever possible. Where this is not possible, then temporary access routes shall be located within the assessed and authorised area (by environmental assessment or specialist walkthrough) and shall require approval from the Contract Manager and ECO.	Contractor	Prior to activity commencing and ongoing for duration of construction	ECO - prior to contractor commencing and as per schedule
5.4.1.4	The location, proposed commencement and duration of construction activities planned on (or traversing) private land shall be communicated in writing to the affected landowners to minimise disturbance to their agricultural/other activities.	Contractor	At least 14 days prior to mobilisation	ECO -as per schedule
5.4.1.5	Every effort shall be made to maintain existing access to private properties, and where this is not possible then suitable temporary access alternatives shall be determined in consultation with the landowner/authorised representative if so required.	Contractor	Duration of construction	ECO -as per schedule
5.4.1.6	Access to properties shall not be impeded for lengthy periods of time: <ul style="list-style-type: none"> <li>• Driveway accesses are not to be blocked over night or over weekends/public holidays unless on agreement with the landowner/authorised representative.</li> </ul>	Contractor	Duration of construction	ECO -as per schedule



## 5.4.2 Fencing and gates

These measures will ensure that fencing and gates are maintained/used/erected in a manner agreed to by the landowner:

Item	Requirement	Responsibility	Implementation Timeframe	Monitoring
5.4.2.1	Existing gates shall be used wherever possible when traversing private property to access the site. <ul style="list-style-type: none"> <li>A photographic record of the existing gates shall be kept, and the gates reinstated to their former status once no longer used for construction purposes.</li> <li>Existing gates that were locked shall remain locked once access is gained, unless otherwise agreed with the landowner.</li> <li>Under no circumstances are existing fences/gate locks to be cut without prior approval from the landowner/authorised representative.</li> </ul>	Contractor	Prior to use	ECO – as per schedule
5.4.2.2	Where access to the site can only be achieved by installing a gate into existing fencing, approval from the Contract Manager and landowner shall be obtained: <ul style="list-style-type: none"> <li>Where gates are installed in specialized fencing (e.g. jackal-proof, game, electrified or security fencing), it must be ensured the gate retains the function of the original fencing, unless otherwise agreed with landowner/authorised representative.</li> <li>Original tension shall be retained in the fence.</li> </ul>	Contractor	Prior to installation	ECO - as per schedule
5.4.2.3	All demarcation fencing and barriers shall be maintained in good working order for the duration of their use.	Contractor	Duration of construction	ECO - as per schedule
5.4.2.4	Temporary fencing shall be removed on completion of works, and the uprights shall be removed completely (ensure uprights are not cut at ground level).	Contractor	On completion of works	ECO - as per schedule

## 5.4.3 Access road management

These measures will minimise impact to the environment through the planned and restricted movement of vehicles, and management of loads:

Item	Requirement	Responsibility	Implementation Timeframe	Monitoring
5.4.3.1	Should the existing private roads be used as haulage routes or access, their current status is to be defined by agreement prior to utilisation, such that the roads can be maintained in a condition as close as possible to their former status and reinstated after construction use. <ul style="list-style-type: none"> <li>Photographic record of the status of any private access roads shall be taken prior to use thereof and retained as a reference for reinstatement.</li> <li>Cognisance of vehicle weight/dimensions shall be taken when using existing access roads constructed out of certain materials (e.g. paved surfaces/cobbled entranceways).</li> </ul>	Contractor	Duration of construction	ECO - as per schedule

5.4.3.2	<p>Any new temporary access roads that are constructed:</p> <ul style="list-style-type: none"> <li>On a slope shall have water diversion structures at regular intervals to reduce flow velocities and divert runoff back along the contour.</li> <li>Shall be kept as narrow as possible.</li> </ul>	Contractor	Duration of construction	ECO - as per schedule
5.4.3.3	<p>Appropriate measures shall be implemented for the management of stormwater runoff and the control of erosion from the road surfaces of access roads:</p> <ul style="list-style-type: none"> <li>To increase longevity, reduce dust and limit erosion, access roads that will be used for more than two years shall be well surfaced with durable materials of appropriate size, and surface cross-slopes shall facilitate good drainage.</li> <li>The Contractor shall ensure that the access roads are maintained and are in good condition by attending to potholes, corrugations and stormwater damage as soon as these develop.</li> <li>The Contractor shall ensure that all side and mitre drains and scour check walls on access roads are functioning properly and are well maintained.</li> <li>Any relevant requirements stipulated by a Water Use Authorisation must also be implemented, if applicable.</li> </ul>	Contractor	Duration of construction	ECO - as per schedule
5.4.3.4	<p>Materials in transit shall be appropriately secured to ensure safe passage between destinations:</p> <ul style="list-style-type: none"> <li>Loads, including but not limited to, sand, stone chip, fine vegetation, refuse, paper and cement, shall have appropriate cover to prevent them spilling from the vehicle during transit (if the material being carted may cause dust or may easily fall out of the vehicles and pose a hazard to other road users).</li> <li>The Contractor shall be responsible for any road clean up resulting from the failure by employees or suppliers to properly secure transported materials.</li> </ul>	Contractor	Duration of construction	ECO - as per schedule
5.4.3.5	<p>Where road dust becomes a hazard to traffic safety or a nuisance to landowners or communities neighbouring the site, effective dust suppression options such as mulching or wetting shall be applied:</p> <ul style="list-style-type: none"> <li>Non-potable water (of suitable quality and from a legal source) used for this purpose shall be used in quantities that will not result in runoff and erosion, or muddy areas (this would, however, need to be balanced against the wasteful use of water).</li> </ul>	Contractor	When experienced as a nuisance or hazard	ECO - as per schedule
5.4.3.6	<p>Vehicle wheel washing with non-potable water could be undertaken where necessary prior to leaving the site to reduce deposition of material on nearby roads. This would only really be appropriate where road traffic is high and where the amount of material carried onto public roads is significant.</p> <ul style="list-style-type: none"> <li>Asphalt road access points near the development site shall be regularly swept free of dust.</li> </ul>	Contractor	Duration of construction	ECO - as per schedule

#### 5.4.4 Traffic management

These measures will ensure that impacts to other road users are minimized:

Item	Requirement	Responsibility	Implementation Timeframe	Monitoring
5.4.4.1	Drivers by law must be licensed and shall be carefully briefed on the appropriate driving practices when operating on the development site.	Contractor	Duration of construction	ECO - as per schedule
5.4.4.2	Reasonable speeds shall be maintained on the access roads in order to prevent accidents, excessive noise and unnecessary dust. Speed limits shall be enforced, and where a speed limit is not specified then speed shall depend on the type of vehicle, status of the road, and other traffic, but speeds between 20 and 40 km/h are typically regarded as acceptable.	Contractor	Duration of construction	ECO - as per schedule
5.4.4.3	Predetermined detour routes are to be selected to reduce traffic disruptions to busy roads by abnormal loads, and such disruptions should be planned at off-peak times where ever possible.	Contractor	Duration of construction	ECO - as per schedule
5.4.4.4	Safety risks associated with the movement of heavily laden, slow moving haulage vehicles shall be effectively managed.	Contractor	Duration of construction	ECO - as per schedule
5.4.4.5	Entry/exit points onto public roads shall take cognisance of traffic safety.	Contractor	Duration of construction	ECO - as per schedule
5.4.4.6	The use of signalmen shall be considered where relevant (e.g. for access onto highly trafficked roads, for roads with poor site distance, or where visibility is impaired).	Contractor	Duration of construction	ECO - as per schedule

## 5.5 SITE REINSTATEMENT, LANDSCAPING AND CLOSURE

#### 5.5.1 Removal of construction infrastructure

These measures will minimise long-term disturbance or pollution to properties following closure:

Item	Requirement	Responsibility	Implementation Timeframe	Monitoring
	<b><i>Removal of structures and infrastructure</i></b>			
5.5.1.1	All construction plant, equipment, storage containers, temporary fencing, temporary services, and fixtures shall be completely removed from site.	Contractor	Prior to site handover	ECO - as per schedule
5.5.1.2	All access roads utilised during construction which are outside of the servitude and not earmarked for use during the operational phase, shall be returned to a state no worse than prior to construction.	Contractor	Prior to site handover	ECO - as per schedule
	<b><i>Inert waste and rubble</i></b>			
5.5.1.3	Inert waste and rubble, including surplus rock, foundations, spoil and batching plant aggregates shall be	Contractor	Prior to site	ECO - as per

	removed and disposed of in accordance with Section 5.3.15. After the material has been removed, the site shall be re-instated and rehabilitated, in accordance with the approved Landscaping and Rehabilitation Plan.		handover	schedule
5.5.1.4	All domestic waste shall be removed from site and dispose of in accordance with Section 5.2.15.	Contractor	Prior to site handover	ECO - as per schedule
	<b><i>Hazardous waste and pollution control</i></b>			
5.5.1.5	All pollution containment structures shall be removed from site.	Contractor	Prior to site handover	ECO - as per schedule
5.5.1.6	All temporary sanitary infrastructure and wastewater disposal systems shall be removed from site. Take care to avoid leaks, overflows and spills and dispose of any waste in the approved manner.	Contractor	Prior to site handover	ECO - as per schedule

## 5.5.2 Reinstatement

These measures will ensure areas disturbed during the construction phase are returned to a state that approximates original condition, or allows for the natural reestablishment by suitable vegetation:

Item	Requirement	Responsibility	Implementation Timeframe	Monitoring
	<b><i>Landscaping</i></b>			
5.5.2.1	Programme the backfill of excavations so that subsoil is deposited first, followed by the topsoil. Compact in layers for best results.	Contractor	Prior to site handover	ECO - as per schedule
5.5.2.2	Monitor backfilled areas for subsidence (as the backfill settles) and fill depressions using available material.	Contractor	Prior to site handover	ECO - as per schedule
5.5.2.3	Ensure that no excavated material or stockpiles are left on site and that all material remaining after backfill is landscaped or removed from site and disposed of at a suitably licensed waste disposal site.	Contractor	Prior to site handover	ECO - as per schedule
	<b><i>Topsoil replacement and soil amelioration</i></b>			
5.5.2.4	Execute top soiling activity prior to the rainy season or any expected wet weather conditions.	Contractor	Prior to site handover	ECO - as per schedule
5.5.2.5	Execute topsoil placement only after all construction work has ceased.	Contractor	Prior to site handover	ECO - as per schedule
5.5.2.6	Replace and redistribute stockpiled topsoil together with herbaceous vegetation, overlying grass and other fine organic matter in all disturbed areas of the construction site, including temporary access routes. Replace topsoil to the original depth.	Contractor	Prior to site handover	ECO - as per schedule
5.5.2.7	Place topsoil in the same area from where it was stripped. If there is insufficient topsoil available from a particular soil zone to produce the minimum specified depth, topsoil of similar quality may be brought from other areas of similar quality. The suitability of substitute material will be determined by means of a soil	Contractor	Prior to site handover	ECO - as per schedule

	analysis addressing soil fraction, fertility, pH and drainage.			
5.5.2.8	Do not use topsoil suspected to be contaminated with the seed of alien vegetation (e.g. black wattle). Alternatively, the soil is to be appropriately treated.	Contractor	Prior to site handover	ECO - as per schedule
5.5.2.9	Ensure that stormwater run-off is not channelled alongside the gentle mounding, but that it is taken diagonally across it.	Contractor	Prior to site handover	ECO - as per schedule
5.5.2.10	Shape remaining stockpiled topsoil not utilised elsewhere in an acceptable manner so as to blend in with the local surrounding area.	Contractor	Prior to site handover	ECO - as per schedule
5.5.2.11	After topsoil placement is complete, spread available stripped vegetation randomly by hand over the top-soiled area.	Contractor	Prior to site handover	ECO - as per schedule
5.5.2.12	Newly cleared soils will have to be re-vegetated and stabilised as soon as construction has been completed and there must be an on-going monitoring program to control and/or eradicate newly emerging alien invasive plants until site handover.	Contractor	Prior to site handover	ECO - as per schedule
5.5.2.13	Machines must remove the stone material and transport it to another location to be re-used if it is required, removed correctly to a licensed facility, or offered to the landowner.	Contractor	Prior to site handover	ECO - as per schedule
5.5.2.14	If applicable, the geotextile base material, and other foreign material must also then removed during rehabilitation.	Contractor	Prior to site handover	ECO - as per schedule
	<b><i>Ripping and scarifying</i></b>			
5.5.2.15	Rip and / or scarify all areas following the application of topsoil to facilitate mixing of the upper most layers. Whether ripping and/or scarifying is necessary will be determined based on the site conditions immediately before these works begin.	Contractor	Prior to site handover	ECO - as per schedule
5.5.2.16	Rip and / or scarify all disturbed (and other specified) areas of the construction site, including temporary access routes and roads, compacted during the execution of the works.	Contractor	Prior to site handover	ECO - as per schedule
5.5.2.17	Rip and / or scarify along the contour to prevent the creation of down-slope channels.	Contractor	Prior to site handover	ECO - as per schedule
5.5.2.18	Do not rip and / or scarify areas under wet conditions, as the soil will not break up.	Contractor	Prior to site handover	ECO - as per schedule
5.5.2.19	The area must be ripped to an appropriate depth (at least 300 mm) to remove any minor compaction.	Contractor	Prior to site handover	ECO - as per schedule

### 5.5.3 Revegetation

These measures will ensure that any revegetation activities will promote rapid soil cover and indigenous growth:

Item	Requirement	Responsibility	Implementation Timeframe	Monitoring
5.5.3.1	Revegetation and maintenance shall occur as per the methods described and areas of the site identified	Contractor	Prior to site	ECO - as per

	in the Landscaping and Rehabilitation Plan.		handover	schedule
5.5.3.2	Temporary fencing or similar shall be considered on areas where livestock have free access, and choice of plant species could give preference to non-palatable species, if appropriate.	Contractor	Prior to site handover	ECO - as per schedule
	<b>Grassing</b>			
5.5.3.3	The areas that have been denuded and disturbed as a result of the construction on site, and that will be revegetated, shall be revegetated as soon as possible, and preferably with indigenous vegetation.	Contractor	Prior to site handover	ECO - as per schedule
5.5.3.4	Suitably trained personnel shall undertake revegetation by making use of the recommended methods, appropriate equipment and specified grass species as determined by the Landscaping and Rehabilitation Plan. For best results: <ul style="list-style-type: none"> <li>• Sodding may be done at any time of the year.</li> <li>• Seeding should be done during a season when the germination rate is better.</li> <li>• Hydroseeding is typically done where revegetation is urgent or where slopes are problematic and is more successful during a season when the growth rate is better.</li> </ul>	Contractor	Prior to site handover	ECO - as per schedule
5.5.3.5	Specifications for sods, runners and hand seeding shall be determined by the Landscaping and Rehabilitation Management Plan.	Contractor	Prior to site handover	ECO - as per schedule
	<b>Maintenance</b>			
5.5.3.6	Monitor the re-growth of vegetative material, and address issues of erosion, trampling, and grazing accordingly.	Contractor	Duration of retention period	ECO - as per schedule
5.5.3.7	Cordon off areas that are under rehabilitation as no-go areas.	Contractor	Prior to site handover	ECO - as per schedule
5.5.3.8	Control invasive plant species and noxious weeds by means of extraction, cutting or other approved methods.	Contractor	Duration of retention period	ECO - as per schedule
5.5.3.9	For planted areas that have failed to establish, revegetate according to subsequent recommendations made by the terrestrial ecologist.	Contractor	Duration of retention period	ECO - as per schedule

## 6 OPERATION PHASE

### 6.1 DISTRIBUTION OF ELECTRICITY

#### 6.1.1 Environmental sensitivities for operation

These measures will ensure that the specialist requirements are implemented during the operational phase to minimize environmental impact:

Item	Requirement	Responsibility	Implementation Timeframe	Monitoring
	<b>Terrestrial Ecology</b>			
6.1.1.1	Alien clearing and continued management in and around those parts of the development footprint that are within natural to near-natural vegetation to improve habitat quality of these areas and limit further degradation of the site from alien invasion.	Proponent to engage with relevant specialist	Operation	TBC
	<b>Aquatic Ecology</b>			
6.1.1.2	Stormwater systems are to be inspected on an annual basis to ensure that the systems are functional.	Proponent (Operator)	Operation	TBC
	<b>Bats</b>			
6.1.1.3	Mitigation and monitoring as per the Bat Management Plan shall be implemented (for the duration specified) during the operational phase and shall be undertaken by a suitably qualified specialist.	Proponent to engage with relevant specialist	Operation	TBC
	<b>Avifauna</b>			
6.1.1.4	Provision for a mitigation contingency budget for the operational phase should be made for the potential avifaunal impacts that may arise during operation.	Proponent		
6.1.1.5	If Blue Crane turbine or power line collision fatalities occur as a result of livestock feeding points once the facility is operational, this will need to be mitigated, probably by restricting farmers from feeding too close to turbines (200-300 m) and power lines. or by covering/ obstructing the feeding points in some way that prevents the birds from easily feeding from them (as was done successfully with fence wires at an existing wind farm in the Overberg area for feeding points for sheep). Landowners should be made aware of this possibility at the outset of the project.	Proponent	Operation	TBC
	<b>Noise &amp; Shadow Flicker</b>			

6.1.1.6	Measurements shall be taken of the actual shadow-flicker impact at the identified sensitive receptors given the assessment used conservative assumptions and it is likely the actual impacts will be less than modelled: <ul style="list-style-type: none"> <li>If exceedances have been determined, blinds shall be installed in the affected windows and/or trees and evergreen vegetation (indigenous) shall be planted between the turbines and the affected windows.</li> </ul>	Proponent	Operation	TBC
	<b>Traffic</b>			
6.1.1.7	Proponent to contribute to the maintenance of the public roads in the area during operation phases of the development.	Proponent (Operator)	Operational Phase	TBC
6.1.1.8	A photographic record of the road condition should be maintained throughout the operational phase of the development. This provides an objective assessment and mitigates any subjective view from road users.	Proponent (Operator)	Operational Phase	TBC
6.1.1.9	Transport Management Plan is to be revised for the operational phase of the development.	Proponent (Operator)	Operational Phase	DEA
6.1.1.10	Ensure all vehicles are roadworthy, visible, properly marked, and operated by an appropriate licenced operator.	Proponent (Operator)	Operational Phase	TBC
	<b>Socio-Economic</b>			
6.1.1.11	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.	Proponent (Operator)	Operational Phase	TBC
6.1.1.12	Where possible, local labour should be considered for employment so as to increase the positive impact on the local economy	Proponent (Operator)	Operational Phase	TBC
6.1.1.13	As far as possible, local SMMEs should be approached to investigate the opportunities for supply inputs required for the maintenance and operation of the facility.	Proponent (Operator)	Operational Phase	TBC
6.1.1.14	Enterprise development and socio-economic development initiatives outlined in the REI4P bid must be effectively implemented: These plans should be reviewed on an annual basis and, where necessary, updated.	Proponent (Operator)	Operational Phase	TBC
6.1.1.15	When identifying enterprise development initiatives, the focus should be on creating sustainable and self-sufficient enterprises.	Proponent (Operator)	Operational Phase	TBC
6.1.1.16	In devising the programmes to be implemented through these allocations, the developer should take into account the local Integrated Development Plans.	Proponent (Operator)	Operational Phase	TBC



## 6.1.2 Maintenance of Infrastructure

These measures will ensure that maintenance activities are undertaken in a socially and environmentally considerate manor:

Item	Requirement	Responsibility	Implementation Timeframe	Monitoring
6.1.2.1	Negotiate with landowners the timing of the maintenance activities within agricultural properties / land. <ul style="list-style-type: none"> <li>Suitable access arrangements to be made with landowners.</li> <li>Safeguarding of livestock / game against maintenance activities (e.g. barricading excavations).</li> <li>Where relevant, air traffic (helicopter inspections) associated with the operation of the transmission line to take cognisance of aerial irrigation and spraying activities in agricultural areas.</li> </ul>	Proponent (Operator)	Operation	TBC
6.1.2.2	Regular inspection of infrastructure (substations, powerlines and roads) must take place to manage risks.	Proponent (Operator)	Operation	TBC
6.1.2.3	Should new stringing be required, then these shall be fitted with BFDs (if originally required for the section in question or subsequently required following monitoring by the Avifaunal specialist).	Proponent (Operator)	Operation	TBC
6.1.2.4	All vehicle movements must be restricted to designated operational access or service roads, gates and crossings.	Proponent (Operator)	Operation	TBC
6.1.2.5	Existing roads/track must be maintained to ensure limited erosion and impact on areas adjacent to roads. <ul style="list-style-type: none"> <li>Monitor culverts to see if any erosion control is required. Should any erosion features develop, they shall be stabilized as soon as possible.</li> <li>Monitor stormwater management, specifically run-off control system. Should erosion occur downstream, the system will need to be maintained/ upgraded.</li> </ul>	Proponent (Operator)	Operation	TBC
6.1.2.6	The taller woody vegetation should only be cleared where this is necessary for operational safety of the transmission line. Taller succulent species such as tree euphorbias should be left in place as they do not pose a fire risk (as such species do not burn).	Proponent (Operator)	Operation	TBC
6.1.2.7	The standard construction specifications apply to all maintenance and repair work. <ul style="list-style-type: none"> <li>All maintenance works shall be undertaken in an environmentally responsible manner.</li> <li>Any areas disturbed during maintenance shall be reinstated such that any disturbed areas are properly reshaped, top soiled and if needed, seeded with indigenous grass seed.</li> <li>Maintenance and repairs involving earthworks or disturbance to the ground shall be implemented according to the relevant best practices cited in the specifications.</li> </ul>	Proponent (Operator)	Operation	TBC
6.1.2.8	Broken infrastructure must be disassembled and removed off-site as soon as reasonably possible after breakdown.	Proponent (Operator)	Operation	TBC

## 7 DECOMMISSIONING PHASE

### 7.1 LIFE-CYCLE CONCLUSION

#### 7.1.1 Environmental sensitivities for decommissioning

These measures will ensure that the specialist requirements are implemented during the operational phase to minimize environmental impact:

Item	Requirement	Responsibility	Implementation Timeframe	Monitoring
	<b>Terrestrial Ecology</b>			
7.1.1.1	Regular monitoring of alien plants within the disturbed areas for at least two years after decommissioning or until alien invasive plants are no longer a problem at the site: <ul style="list-style-type: none"> <li>Regular Alien clearing should be conducted using best practice methods for species concerned.</li> </ul>	Proponent	Decommissioning Phase	ECO – as per appointment and schedule
7.1.1.2	Any potentially dangerous fauna such as snakes threatened by the decommissioning activities should be removed to a safe location prior to commencement of decommissioning activities.	Proponent to engage with relevant specialist	Decommissioning Phase	ECO – as per appointment and schedule
7.1.1.3	To reduce the impacts to terrestrial ecology as a result of decommissioning: <ul style="list-style-type: none"> <li>Above-ground infrastructure should be removed from site. Below-ground infrastructure such as cabling can be left in place if it does not pose a risk, as removal of such cables may generate additional disturbance and impact, however, this should be in accordance with the facilities' decommissioning and recycling plan.</li> </ul>	Proponent & Contractor	Decommissioning Phase	ECO – as per appointment and schedule
	<b>Visual</b>			
7.1.1.4	To reduce the visual impact of the decommissioned site: <ul style="list-style-type: none"> <li>Wind turbines shall be removed and building structures demolished or recycled for new uses.</li> <li>Hardened platform areas and access roads no longer required, shall be ripped and regraded.</li> <li>Exposed or disturbed areas shall be revegetated or returned to grazing pasture or natural vegetation to blend with the surroundings.</li> </ul>	Proponent & Contractor	Decommissioning Phase	ECO – as per appointment and schedule

## 7.1.2 Removal of infrastructure

These measures will ensure that decommissioning is undertaken in a socially and environmentally considerate manor:

Item	Requirement	Responsibility	Implementation Timeframe	Monitoring
7.1.2.1	All decommissioning activities must be restricted to the development footprint as far as possible. A pre-site investigation shall be undertaken to identify any sensitive areas that should be avoided.	Proponent (Operator)	Decommissioning	TBC
7.1.2.2	Procedures for the removal of infrastructure, buildings, pylons and substation structures during decommissioning are to be implemented according a decommissioning and recycling plan to a visually acceptable standard, and signed off by the delegated authority: <ul style="list-style-type: none"> <li>• Transmission line cables shall be removed, and substations shall be demolished or regentrified for an alternative purpose.</li> <li>• All above-ground infrastructure such as pylons shall be removed from the site.</li> <li>• Below-ground infrastructure such as cabling or pylon foundations can be left in place if it does not pose a risk, as removal of such infrastructure may generate additional environmental disturbance and impact, however, this should be in accordance with the facilities' decommissioning and recycling plan, and as per the agreements with the landowners concerned.</li> <li>• All above-ground components that are associated with the project infrastructure, such as fencing, signs etc. must be removed from site.</li> <li>• Reuse and recycling is preferable wherever possible.</li> </ul>	Proponent (Operator)	Decommissioning	TBC
7.1.2.3	Effective communication should be undertaken with landowners about the timing and location of decommissioning activities.	Proponent (Operator)	Decommissioning	TBC
7.1.2.4	Excavated holes or trenches are to be filled and reinstated, and any structures at risk of collapsing are to be	Proponent (Operator)	Decommissioning	TBC
7.1.2.5	Exposed or disturbed areas shall be revegetated and stabilized prior to being handed back to former landowners.	Proponent (Operator)	Decommissioning	TBC
7.1.2.6	Access roads which are no longer required are to be ripped and rehabilitated.	Proponent (Operator)	Decommissioning	TBC
7.1.2.7	Any roads that will not be rehabilitated, should have runoff control features which redirect water flow and dissipate any energy in the water which may pose an erosion risk. Any roads that will not be used, must be closed and form part of the rehabilitation.	Proponent (Operator)	Decommissioning	TBC
7.1.2.8	Regular monitoring for alien plants within the disturbed areas shall be undertaken for at least two years after decommissioning or until alien invasives are no longer a problem at the site.	Proponent (Operator)	Decommissioning	TBC
7.1.2.9	Erosion should be monitored annually for at least 3 years after decommissioning and any erosion problems observed along the servitude should be rectified as soon as possible using the appropriate revegetation and erosion control works.	Proponent (Operator)	Decommissioning	TBC

# Appendix F1

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## Curriculum Vitae



## Claire Blanché

### Senior Environmental Consultant

Claire is currently employed as a Senior Environmental Scientist in Aurecon's Cape Town office and offers technical expertise in Environmental Impact Assessment (EIA), Environmental Management Programmes (EMPrs), Training & Capacity Building, Constraints Analysis and Pre-feasibility Assessment. Claire has also contributed towards research and State of Environment Reporting, specifically in the fields of air quality and climate change.

Most notably, Claire has led teams of consultants, specialists and scientists, focusing on large-scale linear-type developments (roads, pipelines and stormwater infrastructure) and on multi-process applications. She has gained skills in the execution of plant rescue activities, and the rehabilitation of linear projects. For the last seven years, Claire has been a lead consultant for multi-disciplinary teams on projects in South Africa, such as the SANBI Working for Wetlands Project focussed on all nine provinces of the country, and the Department of Transport and Public Works (DTPW) Borrow Pit Acquisition Project in the Western Cape. Claire has also compiled Strategic Maintenance Management Plans for the Laingsburg and the Worcester Local Municipal Areas for road-over-water structures on behalf of DTPW. She has contributed towards projects involving training and capacity building, and has applied a workshop approach to tailor innovative solutions for clients.

Claire studied at the University of KwaZulu-Natal, South Africa and obtained a Master in Environment and Development in 2001, including components in integrated environmental management (IEM) procedures, project management and planning, environmental auditing, environmental law, and rural land and community development, with specialisations in water resources and catchment management. Claire has been a member of the International Association for Impact Assessment, South African Affiliate (IAIAsa) member since 2005, was the Vice Chair of the IAIAsa KZN Branch in 2009, and was an elected member of the IAIAsa National Executive Committee from 2009 to 2011. Claire served on the Western Cape IAIAsa committee as the Authority Liaison between 2014 and 2015. Claire is also a lifetime member of the Golden Key National Honor (*Sic*) Society for Outstanding Scholastic Achievement and Excellence.

### Publications

Simpson, A and Blanché C, 2005. "*Air Quality and Climate*". Chapter in the KwaZulu-Natal State of Environment Report: Institute of Natural Resources for the Department of Agriculture and Environmental Affairs, Cedara.

Simpson, A, Blanché C and Ryder, H, 2003. "*Air Quality and Climate*". Chapter in the Mangaung State of Environment Report: Mangaung Local Municipality (MLM), Environmental Management Unit, Bloemfontein.

Blanché C, and Quinn N, 2003. "*The Use of Riparian Buffer Zones for the Attenuation of Nitrate in Agricultural Landscapes*". Published in: A Decision Support System for Rehabilitation and Management of Riparian Systems. Report No. 1097/1/03. Water Research Commission (WRC).

Challen D, Quinn N, and Blanché C, 2003. "*Assessing Riparian Habitat: An Approach for Planning Rehabilitation*". Published in: A Decision Support System for Rehabilitation and Management of Riparian Systems. Report No. 1064/1/03, Water Research Commission (WRC).

### Qualifications

Master in Environment and Development

BSc (*Hons*) in Applied Environmental Science

BSc in Environmental Science, and in Psychology

Lifetime Inaugural Member, Golden Key International Honour Society (GKIHS)

Elected Member of the National Executive Committee, International Association for Impact Assessments South Africa (IAIASA) (2009 – 2010)

KwaZulu-Natal Committee Member: Vice-Chair, International Association for Impact Assessments South Africa (IAIASA) (2008-2009)

Western Cape Committee Member: Authority Portfolio, International Association for Impact Assessments South Africa (IAIASA) (2015-2016)

### Specialisation

Linear development, and water catchment management

### Years in industry

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## Claire Blanché Senior Environmental Consultant

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### Project Awards

#### *Athlone Cooling Tower Demolition Project*

Construction World Best Projects 2011 Award, Crown Publications, Highly Commended: Demolition of the Athlone Cooling Towers. Kayad Knight Piésold, 2011.

Consulting Engineers South Africa (CESA) Aon Engineering Excellence Awards: Commendation Award in the category for projects less than R50 million - The Demise of the Athlone Cooling Towers for the City of Cape Town Electrical Services. Kayad Knight Piésold, 2011. Claire wrote the EMPr and coordinated both the specialist teams and the stakeholder engagement process, ensuring demolition in compliance with the environmental legislation.

#### *Western Aqueduct Strategic Infrastructure Project*

International Association for Impact Assessment South Africa (IAIAsa): Special Recognition Award in the Premier Award category for Excellence in Environmental Management and Project Execution - The Western Aqueduct. Knight Piésold and eThekweni Municipality 2010. Claire prepared the EIA, wrote the suite of EMPs, and supervised the monitoring and auditing of construction work.

### Academic Contributions

#### *University of KwaZulu-Natal (UKZN), South Africa*

From 2004 to 2005, Claire lectured the Integrated Environmental Management Courses at the University of KwaZulu-Natal, which were designed as both modules for the Master degree in Environment and Development, and as Certificate courses for external students.

In 2002 she served as Course Facilitator in an Introductory Course to River Rehabilitation and Planning presented to Master students at the University of Natal.

#### *Wildlife society*

From 2011 to 2014, Claire lectured a component on Environmental Best Practice at the annual WESSA Training Course on Environmental Impact Assessment and Environmental Law (Cape Town, South Africa).

## Project Experience

### Integrated Environmental Permitting (EIA's, EMP's and MMP's)

#### ***Environmental Impact Assessment (EIA) for the Western Aqueduct, KwaZulu-Natal Province, South Africa, eThekweni Metropolitan Municipality Water and Sanitation 01/2006 - 12/2008. Project Leader.***

Claire was responsible for undertaking the Public Participation Process (PPP), and the scoping and Environmental Impact Assessment (EIA) processes associated with the 73km bulk water pipeline, with a diameter of 1.6m. Claire's duties as the lead included the design of an appropriate methodology to deal with the variety of biophysical and socio-economic environments along the route; the coordination of renowned specialist teams; the public consultation with all Interested and Affected Parties (I&AP), including government departments, stakeholders and interest groups; the liaison between the engineering design team, the client and the specialist teams; and the compilation of the relevant reports, documents and correspondence.



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***Environmental Management and Rehabilitation of the Western Aqueduct, Phase 1, KwaZulu-Natal Province, South Africa, eThekweni Water Metropolitan Waters and Sanitation, 01/2009 - 12/2010, Project Leader.*** The Western Aqueduct project was a bulk water supply project required to secure potable water for the Greater Durban Area. Claire was responsible for managing the design and compilation of the Environmental Management Plan (EMP), the Communication Plan, the Spoil Management Plan, and the Rehabilitation Plan, including the rehabilitation specification and Bill of Quantities (BoQ) for the rescuing of indigenous plant materials from the proposed footprint of the 73km bulk water pipeline, and the rehabilitation of the 30m-wide corridor following construction. This project was awarded the International Association for Impact Assessment South Africa's (IAIAsa) 2011 Special Recognition Certificate for excellence in project execution.

***Independent Review of the Environmental Impact Assessment (EIA) for the Northern Aqueduct, KwaZulu-Natal Province, South Africa, Knight Piésold Consulting 01/2011 - 03/2011. Independent Reviewer.*** Claire was responsible for undertaking the Independent Review of the scoping and Environmental Impact Assessment (EIA) processes, including the Public Participation Process (PPP) and specialist studies, associated with a bulk water pipeline. The large pipeline (diameter of 1.6m) was proposed as an extension to the Western Aqueduct to supply potable water to the northern parts of the eThekweni Municipality. The main function of the review was to ensure that the objectivity of the Environmental Assessment Practitioners was not compromised by their association with the design engineers, and that the requirements in terms of the environmental legislation had been met.

***Piketberg stormwater infrastructure upgrade, Western Cape province, South Africa, USD Africa, 05/2012 – 04/2013. Project Leader.*** This project involved the basic assessment process and environmental management plan (EMP) for the proposed upgrade of the stormwater infrastructure in the town of Piketberg.

***Borrow pits for the Department of Transport and Public Works, Western Cape Province, South Africa, Western Cape Government Department of Transport and Public Works, 11/2012 – 04/2016. Team Leader (NEMA Component).*** This project involves basic assessment processes and environmental management plans (EMP's) for approximately 50 borrow pits which will be used as material sources for road re-gravelling and maintenance programmes within the Overberg, Eden and Central Karoo Districts of the Western Cape. The broader project includes the identification of suitable material sources, and the legalisation of preferred borrow pits in terms of the National Environmental Management Act, No. 107 of 1998, the Minerals and Petroleum Resources Development Act, No. 28 of 2002, the National Heritage Resources Act, No. 25 of 1999, the National Water Act, No. 36 of 1998 and the Land Use Planning Ordinance, No. 15 of 1985. The project therefore required the coordination of these processes and detailed liaison with the relevant Organs of State. A key component of the project was to obtain the necessary water use authorisations associated with the proposed works, and multiple registrations have been lodged with the Department of Water and Sanitation.

***Maintenance Management Plans (MMPs) for flood damaged road infrastructure, Western Cape Province, South Africa, Western Cape Provincial Department of Transport and Public Works, 06/2015 – 10/2016. Project Leader.*** The project entails the compilation of MMPs for two local municipal areas (Laingsburg and Worcester), for road-over-water structures requiring reconstruction following flood events, or routine/emergency maintenance. A key component of the



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project was to obtain the necessary water use authorisations associated with the proposed works, and multiple registrations have been lodged with the Department of Water and Sanitation.).

### ***Working for Wetlands Programme, all provinces, South Africa, SANBI, 05/2012***

**- Date. Project Leader (Environmental Component).** Working for Wetlands (WfWetlands) is a government programme managed by the South African National Biodiversity Institute (SANBI), and is a joint initiative of the Departments of Environmental Affairs, Water Affairs and Agriculture, Forestry and Fisheries. The programme is mandated to rehabilitate damaged wetlands and to protect pristine wetlands throughout South Africa, with an emphasis on complying with the principles of the Expanded Public Works Programme which seeks to draw significant numbers of unemployed people into the productive sector of the economy, gaining skills while they work and increasing their capacity to earn an income. Claire is a co-leader in the undertaking of basic assessment processes to apply for environmental authorisation to work in many wetland projects throughout South Africa (approximately 15 – 25 Wetland Projects per year). Claire was also largely responsible for the coordination of wetland ecologists, engineers and environmental scientists to undertake site investigations and deliver detailed Rehabilitation Plans for each wetland project, as well as the public participation processes associated with the rehabilitation proposals.

***Impofu Wind Farms, Eastern Cape Province, South Africa, Red Cap Impofu, 08/2017 - date, Senior Environmental Scientist.*** Aurecon was appointed to undertake EIAs for three wind farms known as the Impofu Wind Farms, as well as a basic assessment report (BAR) for associated grid connection infrastructure to connect the wind farms to the grid. Responsibilities include technical support for the screening process to establish the sensitivities on the wind farm site and therefore the most suitable areas for development, as well as the development of the public consultation approach.

### ***Penhill Greenfields Development Project, Western Cape Province, South Africa, Western Cape Government, Department of Human Settlements, 08/2016***

**- date, Senior Environmental Scientist.** The project involves the development of approximately 8,000 formal housing opportunities as part of a mixed-use development on a greenfields site in the City of Cape Town, as part of the Southern Corridor Integrated Human Settlements Programme. Responsibilities include the development of the EMP for the EIA.

### **Stakeholder Engagement, Training & Capacity Building**

#### ***Shire River Basin Management Program (SRBMP) catchment and infrastructure development guideline (Shire River Basin, Malawi) 06/2013 – 2016. Training Facilitator, and Contributor to Guideline Document.***

The aim of the project was to compile a set of practical national guidelines on water catchment management, specifically on developing catchment management plans (CMPs) and rural infrastructure development plans (IDPs). The guidelines target spatial clusters of differing scales (from village, district and catchment level to a national level) as well as different literacy levels. The project included intensive stakeholder engagement, and required the data collection and review of existing manuals and guidelines as well as field reconnaissance to determine the types of projects and scale application. From this, draft guidelines were produced, and intensive training workshops were held to build capacity within the district authorities and extension officers. Claire's responsibilities included the contribution to the compilation of



training work manuals, course curricula and training video material. Claire facilitated the (3 day) training workshops in Malawi aimed at disseminating guideline information to district extension officers and agricultural representatives.

***Air Quality Management (AQM) training and air emissions licensing training, Western Cape Province, South Africa, Cape Winelands District Municipality, 03/2011 - 06/2011, Project Leader.*** The aim of the project was to empower the Cape Winelands District Municipality as the Competent Authority in matters pertaining to Air Quality Management (AQM) and emissions licensing in terms of the National Environmental Management: Air Quality Act (NEMAQA), enabling them to fulfil their responsibilities across five local municipalities in the Cape Winelands District. Claire facilitated a series of workshops that were hosted to build capacity within the municipality.

#### Tailored Consulting

***Working for Wetlands Programme Strategy Workshop, all provinces, South Africa, SANBI, 01/2018 - Date. Project Leader (Environmental Component).*** Working for Wetlands (WfWetlands) is a government programme managed by the South African National Biodiversity Institute (SANBI), and is a joint initiative of the Departments of Environmental Affairs, Water Affairs and Agriculture, Forestry and Fisheries. The programme is mandated to rehabilitate damaged wetlands and to protect pristine wetlands throughout South Africa, with an emphasis on complying with the principles of the Expanded Public Works Programme which seeks to draw significant numbers of unemployed people into the productive sector of the economy, gaining skills while they work and increasing their capacity to earn an income. Claire coordinated the planning and execution of an exploratory Design Led Thinking workshop (led by Aurecon i40 members) to explore creative solutions and an innovative approach to the project programme.

***Alien Invasive Species Management for the Witzenberg Local Municipality, Western Cape Province, South Africa, Witzenberg Local Municipality, 03/2017-06/2017, Project Leader.*** The project was to deliver an Invasive Species Strategy that would provide a framework to allow the municipality to fulfil its responsibilities in managing and controlling invasive alien species on land under its jurisdiction. The project included the compilation of two Invasive Species Monitoring, Control and Eradication Plans (for the Ceres Mountain Fynbos Nature Reserve and the Wolseley Commonage). A core component of the project was to host a series of workshops with key stakeholders and role players to understand client expectations, gather knowledge on historical and existing initiatives, prepare a strategic plan, and to investigate partnerships, and Claire planned and facilitated these.

***Water Remix Facility (desalinated and reused waste water), Durban Bluff, KwaZulu-Natal Province, South Africa, Hitachi, 02/2016-01/2017, Co-Project Leader.*** The project was to investigate the Environmental permitting requirements associated with a water remix facility proposed at the Durban Central Wastewater Treatment Works, including a Demonstration facility and a Commercial Plant. The proposal was to blend desalinated sea water with treated wastewater effluent, and to treat this to potable standard to augment the water supply to the Greater Durban Area. The project required a series of investigative workshops with Competent and Commenting Authorities, and Stakeholders or Key Community Representatives, and Claire planned and hosted these.

***Demolition of Athlone Cooling Towers, Western Cape Province, South Africa, City of Cape Town, 03/2010 - 08/2010, Project Leader*** This project involved the



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expedient demolition of two benign cooling towers due to structural instability. Claire was responsible for undertaking the development of an appropriate Environmental Management Plan (EMP) for the planning, demolition and clean-up of the towers. Claire coordinate all specialist teams, including those appointed to investigate noise, dust and vibration mitigation, and avifauna management (the relocation of Peregrine Falcon nesting boxes). Claire also hosted a series of workshops with authorities and project role players to coordinate efforts. Further to this Claire was responsible for undertaking the general Public Participation Process (PPP). This project won the Consulting Engineers South Africa's (CESA) Aon 2011 Commendation Award for projects under R50 million.

***Incremental Air Quality Impact of the Wallerawang Ash Repository Closure and Rehabilitation Project, New South Wales, Australia, 01/08/18 – 20/08/18.***

**Chapter Author.** EnergyAustralia NSW Pty Ltd closed the Wallerawang Power Station in 2015 and commenced with its decommissioning, demolition and closure. An environmental assessment of the decommissioning and rehabilitation of Wallerawang Ash Repository, including the capping and rehabilitation of a large Kerosene Vale Ash Repository (KVAR) Stage 2, the closure of the Sawyers Creek Ash Dam, and the Lidsdale Cut Landfill Area, and the asbestos repository, and the demolition of associated infrastructure was required. Claire authored the Air Quality Impact chapter of the Environmental Assessment supporting the application to modify the Project Approval, and this chapter drew from a number of existing specialist studies.

***Strategic Environmental Assessment: Determination of Scope for the Draft Integrated Water Resources Management and Development Plan (IWRMDP) for the Athi Basin, Athi Region, Kenya, Ministry of Water and Sanitation, Government of Kenya, 01/09/18 – 30/09/18, Chapter Author.*** The Athi Basin is one of six main river basins that are each the subject of an IWRMDP for the sustainable utilisation and development of water resources. Claire authored the chapter on the determination of the Strategic Environmental Assessment Requirements pertaining to the Basin Plan and its sub-plans.

### Research Contributions

***Tanzania Marine Logistics Base Study, Mtwara Region, Tanzania, Genesis and BG Tanzania, 04/2015 - 06/2015. Research contributor.*** BG Tanzania (BG), as operator, and its partners Ophir and Pavilion, intended to develop the gas fields in offshore Tanzania. A need was identified for a new marine logistics base in the Mtwara Region that would provide construction and logistics support during the construction phase and logistics support during the subsequent operations phase of the field development. Aurecon was appointed to provide an overview of existing facilities and development plans that may impact on development sites, site selection through identification of suitable sites and prioritisation by carrying out a multi-criteria analysis (MCA), advising on land access, acquisition and permitting requirements and reviewing cost estimates. Claire was responsible for contributing towards the research component of the study.

***Disaster Management Framework (DMF) for Ekurhuleni Metropolitan Municipality (EMM), Gauteng Province, South Africa, Ekurhuleni Metropolitan Municipality, 06/2015 – 04/2016. Research contributor.*** The project comprised potential hazard research toward the compilation of the disaster risk and vulnerability assessment report his included the identification of priority high-risk areas and



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developments, enabling of resilience and risk-aware future capital investment and operational planning. Claire was responsible for coordinating a research team authoring sections of the report.

### **Other Integrated Environmental Management Projects (Lead Consultant)**



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- Horizontal dust flux monitoring for the Port of Saldanha terminal, Saldanha, Western Cape Province, South Africa, 10/2011 – 04/2012, Project Leader
- Environmental Management Strategy and Plan for the Jack Muller Core Conservation Zone, Bellville, Western Cape Province, 04/2011 – 08/2011, Project Leader
- Extension to Parys Cemetery, Paarl, Western Cape Province, South Africa, 02/2011 - 07/2011, Project Leader
- Hillside 2 stormwater detention ponds and pipelines, Beaufort West, Western Cape Province, South Africa, 02/2011 - 07/2011, Project Leader
- Umgeni Water pipeline specialist studies, Pietermaritzburg, KwaZulu-Natal Province, South Africa, 2007 - 2008, Project Leader
- Bulk water pipeline, reticulation network and abstraction/treatment plant, Macambini, KwaZulu-Natal Province, South Africa, 2007 - 2008, Project Leader
- School access road upgrade project, Umzumbe, KwaZulu-Natal Province, South Africa, 2007, Project Leader
- Environmental Impact Assessment (EIA) for the Western Aqueduct, KwaZulu-Natal Province, South Africa, eThekweni Water and Sanitation, 01/2006 - 12/2008, Project Leader
- Upgrading of Main Road P100, Ndwedwe, KwaZulu-Natal Province, South Africa, 2006, Project Leader
- Upgrading of Florida Road, Somtseu Road, and Florence Nightingale Drive in Durban, KwaZulu-Natal Province, South Africa, 2006, Project Leader
- Five projects on intersection and pedestrian safety improvements in the Greater Durban Area, KwaZulu-Natal Province, South Africa, 2006, Project Leader
- Tyburn Boulevard water pipeline, Westville, KwaZulu-Natal Province, South Africa, 2006, Project Leader
- Valley of a Thousand Hills reservoir, Botha's Hill, KwaZulu-Natal Province, South Africa, 2006, Project Leader
- Westriding Aqueduct, KwaZulu-Natal Province, South Africa, 2005, Project Leader
- Arlington Sawmill, Nottingham Road, Pietermaritzburg, KwaZulu-Natal Province, South Africa, 2005, Environmental Scientist
- Cathedral Peak Hotel, Drakensberg, KwaZulu-Natal Province, South Africa, 2005, Environmental Scientist
- Daimler-Chrysler Franchise and Industrial Park, KwaZulu-Natal Province, South Africa, 2005, Project Leader
- Victoria Country Club Estate, Pietermaritzburg, KwaZulu-Natal Province, South Africa, 2004, Environmental Scientist
- Skozani aluminium recycling facility, Pietermaritzburg, KwaZulu-Natal Province, South Africa, 2004, Environmental Scientist
- Mabhobhane access road, Maphumulo, Tugela Valley, KwaZulu-Natal Province, South Africa, 2004, Project Leader
- Magabeni Community Project, Mnini, KwaZulu-Natal Province, South Africa, 2003, Environmental Scientist
- Valencia Dam, Gacemann Farm, Bergville, KwaZulu-Natal Province, South Africa, 2003, Environmental Scientist



# Kirsten Jones

Environmental Scientist

## Qualifications

MSc Environmental Science

BSc (Hons) Geography

BSc Zoology and Geography

Member, International Association for Impact Assessment, South Africa (IAIAsa)

Registered Professional Natural Scientist, South African Council for Natural Scientific Professions (SACNASP)

Member, International Association for Public Participation Southern Africa (IAP2 SA)

## Specialisation

Environmental Scientist

## Years in industry

12

Kirsten has twelve years of experience in environmental management, specialising in environmental impact assessments (EIA's), social impact assessments (SIA's), public participation and sustainability related projects. Her experience includes projects in South Africa, the United Kingdom, Namibia, Malawi and Nigeria. In addition to project coordination and management responsibilities, her technical responsibilities have involved the compilation and authoring of EIA chapters and environmental reports, such as legislative reviews, need and desirability, assessment of cumulative effects, land use assessments, review of legislative frameworks, evaluation of route/site options and alternatives assessment, social impact studies and public consultation strategies. Sectors include transport, energy (including renewable energy and power transmission), mining, waste, urban regeneration, wetland rehabilitation and natural resource management. In terms of sustainability, Kirsten has experience in sustainability appraisal within the UK context, as well as projects related to mainstreaming sustainability within the South African local municipal context.

Kirsten holds a Master of Science degree in Environmental Science from the University of KwaZulu-Natal. She is a registered Professional Natural Scientist (Environmental Science) with the South African Council for Natural Scientific Professions (SACNASP) as well as a member of the International Association for Impact Assessment South Africa (IAIAsa) and the International Association for Public Participation Southern Africa (IAP2 SA).

## Experience

### **Impofu Wind Farms, Eastern Cape Province, South Africa, Red Cap Impofu, 08/2017 - 07/2018, Senior Environmental Scientist**

Aurecon was appointed to undertake EIAs for three wind farms known as the Impofu Wind Farms, as well as a basic assessment report (BAR) for associated grid connection infrastructure to connect the wind farms to the grid. Responsibilities include technical lead for the screening process to establish the sensitivities on the wind farm site and therefore the most suitable areas for development. Co-author of the wind farm and grid screening report/s. Scoping Reports are currently in process.

### **Road materials supply strategy, Western Cape Province, South Africa, Western Cape Department of Transport and Public Works, 06/2008 - 02/2020, Environmental Specialist**

Aurecon was appointed to investigate possible material sources for use in maintenance and re-gravelling work on provincial roads in the Western Cape. The scope of work included the facilitation of compliance with the applicable environmental legislation, namely the Minerals and Petroleum Resources Development Act, No. 28 of 2002 (MPRDA), the National Heritage Resources Act, No. 25 of 1999 (NHRA), and the National Environmental Management Act, No. 107 of 1998 (NEMA). Responsibilities included managing a team to conduct over 30 basic assessment reports (BARs) as required under the National



Environmental Management Act (NEMA) (No 107 of 1998) as well as liaising with authorities and other specialists and coordinating the public participation process (PPP).

**The proposed upgrade of the Sam Nujoma West Road in Windhoek, Khomas Region, Namibia, City of Windhoek, 06/2014 - 10/2017, Environmental Specialist**

Upgrading of 5 km of Sam Nujoma Drive to dual carriageways through the centre of Windhoek, including traffic and economic studies, geometrical and structural designs, relocation of utilities, contract documentation and construction administration. Responsibilities included project management of the environmental approval process as well as the compilation of the scoping report and EMP as required under Namibia's Environmental Management Act (No 7 of 2007).

**Proposed gas to power (GtP) project in Saldanha Bay, Western Cape Province, South Africa, Atlantic Renewable Energy Partners (Pty) Ltd, 02/2016 - 06/2017, Environmental Specialist**

The project is a gas to power facility in Saldanha Bay. The project scope includes the onshore components, i.e. gas distribution, power generation, local transmission, substation transform and grid transmission. An upfront environmental screening exercise including an alternatives assessment to inform a future environmental impact assessment (EIA) process was required. Responsible as co-author of the environmental opportunities and constraints analysis to assist with the identification of suitable sites for the project.

**Environmental impact assessment (EIA) for the expansion of approved photovoltaic (PV) facilities near De Aar and Prieska, Northern Cape Province, South Africa, Mulilo Renewable Energy (Pty) Ltd, 03/2013 - 12/2016, Environmental and Social Specialist**

The project involved an environmental impact assessment (EIA) for the expansion of approved solar energy facilities located on the Hoekplaas and Klipgats Farms in Prieska and the Badenhorst Dam and Du Plessis Dam Farms in De Aar. The expansion of Hoekplaas Farm includes ten additional 75 MW photovoltaic (PV) facilities, while the expansion of Klipgats Pan Farm includes six additional PV units. The expansion of Badenhorst Dam Farm includes four additional 75 MW PV facilities, and that of the Du Plessis Dam Farm includes three additional PV units. Responsibilities include socio-economic impact assessments (SEIA's) as well as the summary and collation of the other specialist reports for the EIA's.

**Preparation of national integrated catchment management and rural infrastructure development guidelines, Malawi, Ministry of Agriculture, Irrigation and Water Development (MoAIWD), 01/2014 - 12/2016, Environmental Specialist**

The aim of this project is to address the interlinked challenges of poverty and a deteriorating natural resource base not only in the Shire Basin but in Malawi as a whole, to reduce the process of environmental degradation and improve the productive potential of natural resources. Responsible for assisting with compiling a consolidated network of catchment management guidelines that address best practice for land and natural resources management for the Malawi government. Involvement also included co-authoring the training material for village level implementation of the guidelines.

**Proposed wind energy facility (WEF) near Copperton, Northern Cape Province, South Africa, Copperton Wind Farm (Pty) Ltd, 09/2015 - 11/2016, Environmental Specialist**

The project comprises the environmental authorisation for a 140 MW wind energy facility (WEF) near Copperton in the Northern Cape. Aurecon was appointed to undertake the original environmental authorisation process and subsequent amendment applications. Responsible for managing the submission of an amendment for environmental authorisation which included corresponding with the Department of Environmental Affairs (DEA), managing specialist inputs, drafting of a report and managing the public participation process (PPP).



**Implementation capacity consultant for the Department of Transport and Public Works, Western Cape Province, South Africa, Western Cape Department of Transport and Public Works, 08/2013 - 09/2016, Environmental and Social Specialist**

Aurecon was appointed to provide implementation capacity consulting services to the works education facilities (WEF) directorate for the roll out of infrastructural projects for the period 2013 to 2016, which is a medium-term expenditure framework (MTEF) period. As part of this contract, Aurecon was appointed to investigate and propose measures to implement sustainability in schools, including best practice, good habits and critical interventions for sustainable school infrastructure initiatives. Responsible for the legislative framework review as well as the community integration component that dealt with involvement, partnership and mutual gains.

**Second bridge over the River Niger, Delta State, Nigeria, Nigeria Sovereign Investment Authority (NSIA), 08/2013 - 08/2016, Environmental Specialist**

The Federal Government of Nigeria proposed to construct a second bridge across the River Niger between Onitsha and Asaba and selected the Julius Berger-AIIM Consortium as the preferred bidder. Aurecon was appointed on behalf of AIIM to undertake an environmental and social impact assessment (ESIA) required in terms of the Environmental Decree No 86 of 1992, in accordance with the International Finance Corporation (IFC) guidelines, which included a resettlement action plan (RAP). The aim was to ensure regulatory compliance with the Nigerian environmental legislation and achieve the highest possible compliance with Equator Principles. Responsibilities include client liaison; coordination of the ESIA process, including 16 specialists; writing of the scoping and ESIA reports to meet Nigerian legislation and IFC standards and consultation with environmental authorities.

**Environmental impact assessment (EIA) for the fresh produce business hub in Wanaheda, Windhoek, Namibia, Namibia Development Corporation (NDC), 08/2013 - 08/2016, Environmental Specialist**

Aurecon was appointed to render consulting services for an environmental impact assessment (EIA) for the fresh produce business hub in Wanaheda. The aim was to identify the environmental sensitivities of the proposed development, to assess the potential impacts of development and related activities on the environment and to draft mitigation measures and an environmental management plan (EMP) based on the findings. The EIA also included a detailed traffic assessment of the area. Responsibilities included project management of the environmental approval process as well as the compilation of the scoping report and EMP as required under Namibia's Environmental Management Act (No 7 of 2007).

**Working for Wetlands Plan 2014 - 2017, Regional, South Africa, South African National Biodiversity Institute (SANBI) & Department of Environmental Affairs (DEA), 06/2013 - Date, Environmental Specialist**

Aurecon was appointed in 2010 for a three year cycle for the design, planning, environmental, project and risk management of the South African Government's Working for Wetlands Programme, which is a nationally run initiative by the South African National Biodiversity Institute (SANBI). The programme's objective is to rehabilitate damaged wetlands and to protect wetlands throughout South Africa, with an emphasis on complying with the with an emphasis on complying with the principles of the expanded public works programme (EPWP) through employing only local small, medium and micro enterprises (SMMEs). Responsible for drafting the basic assessment reports (BAR's) and rehabilitation plans for the North West Province and the rehabilitation plans for KwaZulu-Natal and review of the Mpumalanga and Northern Cape Provinces Reports, as well as providing assistance with the public participation process (PPP).



**Robben Island World Heritage Site (WHS): integrated conservation management plan (ICMP), Western Cape Province, South Africa, Robben Island Museum, 10/2012 - 11/2012, Environmental Specialist**

The project entailed the revision of the integrated conservation management plan (ICMP) for Robben Island. The scope of work included an environmental management plan (EMP), as a requirement of the World Heritage Convention Act (No 49 of 1999). Responsible for compiling the EMP. Work included a strength, weakness, opportunity and threat (SWOT) analysis of the natural environment, a review of the legislative framework, interviews with key stakeholders and the development of the EMP.

**Basic assessment for the proposed photovoltaic (PV) solar energy facility on a site south of Sutherland, Northern Cape Province, South Africa, iNca Energy, 06/2010 - 02/2012, Environmental Specialist and Project Coordinator**

The project involved the management of the environmental authorisation process for the proposed photovoltaic (PV) solar energy facility on a site south of Sutherland, in terms of the National Environmental Management Act (NEMA) environmental impact assessment (EIA) regulations (2010). Responsible for the project coordination of the public participation process (PPP) as well as compilation of the draft and final basic assessment reports. Also responsible for liaising with specialists and reviewing specialist studies.

**Mainstreaming environmental projects in integrated development plans (IDPs), Western Cape Province, South Africa, Table Mountain Fund (TMF), 06/2011 - 01/2012, Environmental Specialist**

The project entailed a partnership with the Table Mountain Fund (TMF) to mainstream environmental projects into municipal integrated development plans (IDPs) through 'green projects'. Responsible for facilitating and attending meetings and workshops with local government officials and developing a roadmap for the conceptualisation of appropriate 'green projects'.

**Environmental impact assessment (EIA) for the Kerrie Fontein and Darling Wind Farms, Western Cape Province, South Africa, Oelsner Group (Pty) Ltd, 05/2010 - 11/2011, Environmental Specialist, Social Specialist and Project Coordinator**

The project entailed management of the environmental authorisation process for the Kerrie Fontein and Darling Wind Farms, in terms of the National Environmental Management Act (NEMA) environmental impact assessment (EIA) regulations (2010). Responsible for project coordination of the public participation process (PPP) and the compilation of the scoping and EIA reports. Also responsible for liaising with specialists and reviewing of specialist studies. Also author of the social impact assessment (SIA) as a supporting specialist study.

**Environmental impact assessment (EIA) for the Touwsrivier Solar Energy Facility, Western Cape Province, South Africa, Soitec, 05/2010 - 08/2011, Environmental Specialist and Project Coordinator**

The project comprised the management of the environmental authorisation process for the Touwsrivier Solar Energy Facility, in terms of the National Environmental Management Act (NEMA) environmental impact assessment (EIA) regulations (2010). Responsible for project coordination of the public participation process (PPP) as well as compilation of the scoping and EIA reports. Also responsible for liaising with specialists and review of specialist studies.

**Environmental assessment for the Exeter Park and Ride facility at Alphington Junction, Devon, United Kingdom, Devon County Council (DCC), 06/2009 - 11/2009, Social Specialist**

The project entailed an environmental impact assessment (EIA) for the Exeter Park and Ride facility at Alphington Junction. This project is a component of the Exeter Principal Urban Area (PUA) project, which is included in the Devon Local Transport Plan (LTP) (2006 - 2011). Responsible for the assessment of effects on humans and settlements for inclusion in the environmental statement (ES).





**Environmental assessment for the M5 Junction 29 East of Exeter improvements, Devon, United Kingdom, Devon County Council (DCC), 06/2009 - 10/2009, Social Specialist**

The project entailed an environmental assessment for the improvements to M5 Junction 29 in support of the Exeter and East Devon Growth Point. They are required to improve capacity, safety and amenity to the road network as it continues to support both current and future predicted traffic loads and comprises a new link road to the new Exeter Science Park development. Responsible for the assessment of the pedestrian, cyclists, equestrian and community effects following the Highways Agency's Design Manual for Roads and Bridges (DMRB) guidance for inclusion in the environmental statement.

**Proposed energy-from-waste (EfW) facility and civic amenity recycling centre, Devon, United Kingdom, Devon County Council (DCC), 05/2009 - 10/2009, Social Specialist**

The energy-from-waste (EfW) facility in Barnstaple was proposed by Devon County to provide facilities to deal with residual waste once it has been sorted for reuse, recycling or composting. The project required an environmental impact assessment (EIA). Responsible for the assessment of the socio-economic and community impacts of the proposed EfW facility for inclusion in the environmental statement.

**Hurst to New Cross cable tunnels, London, United Kingdom, National Grid, UK, 07/2008 - 06/2009, Environmental Specialist and Project Coordinator**

The project involved the construction of a 400 kV cable tunnel from Hurst to New Cross, aligning with a number of head houses along the route. The project involved environmental screening of the route and the production of two environmental reports. Responsible for project coordination for the production of two environmental reports to assess the impact of a cable tunnel with associated shafts and head houses, from Hurst to Eltham and Eltham to New Cross. Responsibilities also included client liaison, budget control and preparation of budget variations. Technical tasks included the drafting of the introductory chapters of the scoping report and environmental reports, the non-technical summaries and input into the preferred route and site selection report as well as review of the other planning supporting documents.

**Covanta energy-from-waste (EfW) facility, Cheshire, United Kingdom, Covanta Energy Ltd, 09/2008 - 06/2009, Social Specialist**

The Covanta energy-from-waste (EfW) in Middlewich was proposed to use a mix of commercial and industrial wastes to provide combined heat and power to local homes and businesses. The project involved an environmental assessment. Responsible for assessment of the socio-economic and community impacts of the proposed EfW facility for inclusion in the environmental statement (ES). Also responsible for the preparation of an addendum to submit in support of the planning application in order to update the assessment in the context of the recession.

**Environmental impact assessment (EIA) for Exeter Science Park, Devon, United Kingdom, Devon County Council (DCC), 11/2008 - 04/2009, Environmental and Social Specialist**

The project entailed an environmental impact assessment (EIA) for the Exeter Science Park, which forms part of the Exeter and East Devon Growth Point. The project also involved the compilation of an environmental statement (ES). Responsible for the assessment of the land use impacts and the cumulative environmental effects of the project for inclusion in the ES. Also responsible for the compilation of the community impact assessment (CIA).

**Greenwich Waterfront Transit (GWT), London, United Kingdom, Transport for London (TfL), 10/2008 - 04/2009, Environmental and Social Specialist**

The Greenwich Waterfront Transit (GWT) is a proposed scheme along the south bank of the Thames between Greenwich town centre and Thamesmead, then on to Abbey Wood. The scheme proposes road realignment to allow for the priority of public transport. The project involved identification of route options and environmental assessment. Responsible for the production of the environmental appraisal of route options



report and environmental information for consultation report, as well as an assessment of the cumulative effects for inclusion in the environmental statement (ES). Also responsible for the compilation of the community impact assessment (CIA).

**Environmental impact assessment (EIA) for Walker Technology College, Newcastle upon Tyne, United Kingdom, Aura, 01/2009 - 04/2009, Social Specialist**

Aura proposed to develop two new school buildings and associated sports facilities within an area of open space known as Waverdale, which is located within the Walkergate ward of Newcastle. An environmental impact assessment (EIA) was required. Responsible for a socio-economic and community effects assessment for inclusion in the environmental statement.

**Sustainability assessment for Crawley Borough Council Housing, West Sussex, United Kingdom, Crawley Borough Council, 03/2009 - 04/2009, Environmental Specialist**

The project involved the assessment and scoring of the sustainability of the identified strategic sites on the urban fringe of Crawley town, which have the capacity to accommodate housing development options (including employment and community uses). Responsible for meeting with the planning consultants and collaborating with them to identify options and the assessment of the options in a matrix. Also responsible for authoring the sustainability appraisal report.

**Hereford Regeneration Project, Edgar Street Grid, Herefordshire, United Kingdom, ESG Herefordshire Ltd, 11/2008 - 02/2009, Social Specialist**

The Hereford Regeneration Project in the Edgar Street Grid comprised 43 ha of land north and adjacent to the city centre and is earmarked for development in phases. The project involved the environmental assessment for several of these phases. Responsible for the socio-economic baseline conditions reporting for the project, environmental scoping and assessment of the socio-economic and community impacts for inclusion in the environmental statement (ES) for the link road (Phase 1).

**Environmental evaluation for the East London Transit (ELT) scheme, London, United Kingdom, Transport for London (TfL), 10/2008 - 12/2008, Social Specialist**

The proposed East London Transit (ELT) scheme aimed to provide a high quality busway transit service between the areas of Ilford, Barking and Dagenham to the north of the River Thames, and was delivered in a number of phases. An environmental evaluation was required for Phase 1 of the scheme. Responsible as co-author of the socio-economic chapter of the environmental scoping report and the first stage of the socio-economic assessment as part of the scheme environmental evaluation.

**Scoping report for St Helier Town Park, States of Jersey, States of Jersey, 11/2008, Social Specialist**

The proposed town park in St Helier, States of Jersey required the scoping of environmental impacts as the first phase of an environmental impact assessment (EIA). Responsible for scoping of the socio-economic and community effects of the proposed park.

**Review of the social and environmental compliance for Ibom Power Plant and transmission line, Akwa Ibom State, Nigeria, Fortis Merchant Bank, 09/2007 - 04/2008, Social Specialist**

The project entailed a review, on behalf of the lenders, of the social and environmental compliance of the two environmental impact assessments (EIAs) for the independent power plant (IPP) at Ikot Abasi and associated transmission line, with the World Bank's environmental and social safeguard policies, the Equator Principles and the International Finance Corporation's (IFC's) requirements. Responsible for reviewing the social compliance of the facilities.



**Tewkesbury Borough Council sustainability appraisal, Gloucestershire, United Kingdom, Tewkesbury Borough Council, 03/2008 - 04/2008, Environmental Specialist**

The project comprised sustainability appraisal for Tewkesbury Borough as part of the preparation of its core strategy and development control policies development plan document. Responsible for drafting a scoping report.

**Planning application for the Olympic Energy Centres, London, United Kingdom, Olympic Delivery Authority (ODA), 03/2008, Social Specialist**

As a pre-requisite for development of infrastructure for the London 2012 Olympic Games, the Olympic Delivery Authority (ODA) required outline planning permission for Olympic, Paralympic and legacy transformation infrastructure. A planning application for the King's Yard Energy Centre is part of the approval of reserved matters that was required. Responsible for authoring the equalities statement for submission with the reserved matters planning application.

**Sustainability audit of the power contractors for Lower Lea Valley, London, United Kingdom, Olympic Delivery Authority (ODA), 06/2007 - 09/2007, Social Specialist**

The project comprised a sustainability audit of the operations of the power contractors commissioned by the Olympic Delivery Authority (ODA) to undertake tunnelling work to replace existing overhead power lines through the Lower Lea Valley. Responsible for auditing the social aspects of the contractors.

**New Cairo public-private partnership (PPP) potable water and wastewater treatment plants (W/WWTPs) project study, Cairo, Egypt, Economic Modernization Section, 07/2007, Social Specialist**

As part of the New Cairo public-private partnership (PPP) potable water and wastewater treatment plants (W/WWTPs) project study, a comparison report was required as part of a preliminary environmental and social impact assessment (PESIA). Responsible for interpreting and reporting on the social legislation and guidelines applicable in Egypt, by International Finance Corporation (IFC)/World Bank requirements and by the European Union (EU). A comparison report was produced.

**Widening of the M25 motorway, Section 4, London, United Kingdom, Highways Agency, 12/2006 - 06/2007, Environmental and Social Specialist**

The M25 is the 188 km orbital motorway encircling London. As part of a long term strategy to address congestion and growth, widening of the various sections was proposed. Section 4 included the motorway between Junction 27 and 30. An environmental statement (ES) and community strategy was required to support the proposals. Responsible for the input into the revision and implementation of the overarching communication plan for the M25 rapid widening scheme and the management and coordination of communication activities preceding the publication of the ES for Section 4. Also responsible for the production of a consultation report documenting the communication activities and assessment of cumulative effects for the ES.

**Environmental assessment for the Lamby Way in vessel composting facility, Cardiff, United Kingdom, Cardiff City Council, 03/2007, Social Specialist**

The project entailed an environmental assessment for the proposed in vessel composting facility at Lamby Way, which was a component of Cardiff's Capital Improvement Programme. Responsible for the socio-economic assessment for inclusion in the environmental statement (ES).

**Environmental assessment for the new waste transfer station in Lamby Way, Cardiff, United Kingdom, Cardiff City Council, 03/2007, Social Specialist**

The project entailed an environmental assessment for the new waste transfer station at Lamby Way, which formed a component of Cardiff's Capital Improvement Programme. Responsible for the socio-economic assessment for inclusion in the environmental statement (ES).



**Plymouth major scheme bid (MSB), Eastern Corridor extension, Plymouth, United Kingdom, Plymouth City Council, 04/2006 - 06/2006, Social Specialist**

The Plymouth City Council required the assessment of proposed Plymouth Eastern Corridor transport improvement options to address current and future transport capacity. An environmental statement (ES) was required based on the design manual for roads and bridges (DMRB) 'simple' assessment methodology. Responsible for the assessment of the effects on all travellers (such as pedestrian and cyclists) based on the DMRB guidance for inclusion in the ES.

**Plymouth major scheme bid (MSB), Langage Business Park link road, Plymouth, United Kingdom, Plymouth City Council, 04/2006 - 06/2006, Social Specialist**

The Plymouth City Council required the assessment of proposed options for access to Langage Business Park. An environmental statement (ES) was required based on the design manual for roads and bridges (DMRB) 'simple' assessment methodology. Responsible for the assessment of the effects on all travellers (such as pedestrian and cyclists) based on the DMRB guidance for inclusion in the ES.

**Social impact assessment (SIA) for the proposed Small Craft Harbour, Durban, KwaZulu-Natal Province, South Africa, Durban Point Development Company (Pty) Ltd, 01/2006 - 06/2006, Social Specialist**

The project involved the compilation of a social impact assessment (SIA) as a supporting study to the environmental impact assessment (EIA) for the proposed Small Craft Harbour at the Durban Point Waterfront Development area. Responsibilities included all aspects related to coordinating the SIA: input into the design of the methodology; the creation and maintenance of a stakeholder database; the coordination of public participation and stakeholder workshops; attendance of specialist consultants workshops, compilation of social profile; collection of field data; the analysis of data and report writing.

**Scoping report for the proposed Dube TradePort in Durban, KwaZulu-Natal Province, South Africa, Airports Company of South Africa (ACSA)/Dube TradePort Company, 06/2006, Social Specialist**

The proposed Dube TradePort, comprising the proposed King Shaka International Airport (KSIA) and associated trade zone, required a social impact assessment (SIA) as part of the environmental impact assessment (EIA). Responsibilities included assisting the EIA consultants with the creation of a social profile as a baseline for the social impacts of the airport and adjacent trade zones.

# Appendix F2

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No-Go

**Consolidate No-Go Maps:**

**Sensitivity classifications applicable for each type of infrastructure proposed on the site**

Discipline	No-Go criteria				Notes
	Turbines	Internal overhead power lines	Roads and underground cables	Buildings	
Planning / Existing Infrastructure	<ul style="list-style-type: none"> <li>External boundary with 225 m buffer</li> <li>Internal boundary with 75 m buffer</li> <li>Turbines on adjacent wind farms with 1,000 m buffer</li> <li>N2 with 500 m buffer</li> <li>Public roads with 100 m buffer</li> <li>Structures with 500 m buffer</li> <li>Telkom corridor with 540 m buffer</li> <li>Tsitsikamma Community Wind Farm 132 kV overhead power line with 180 m buffer</li> <li>Gibson Bay Wind Farm 132 kV overhead power line with 180 m buffer</li> </ul>	<ul style="list-style-type: none"> <li>N2 with 100 m buffer</li> <li>Public roads with 30 m buffer (where they run parallel to the road, but they can cross these roads as long as it is at an angle ideally between 45 and 90 degrees and complies with the relevant road authorities' requirements and approval).</li> </ul>	None	<ul style="list-style-type: none"> <li>Farm boundary with 30 m buffer</li> <li>Public roads with 30 m buffer</li> </ul>	Dams and agricultural centre pivots with appropriate buffers are also considered to be a No-Go area however are not included here due to overlap with the specialist No-Go areas.
Terrestrial ecology	<p>Both the 'No-Go' layer and the 'Very High' sensitivity layers have been applied to the consolidated No-Go maps (see notes column):</p> <ul style="list-style-type: none"> <li>No-Go: Critical and unique habitats that serve as habitat for rare/endangered species or perform critical ecological roles and which must be considered to represent no-go areas from a developmental perspective. There is no acceptable loss within these areas and they must be avoided by all infrastructure components.</li> </ul>	<ul style="list-style-type: none"> <li>Same as turbine sensitivity criteria.</li> </ul>	Same as turbine sensitivity criteria.	<ul style="list-style-type: none"> <li>Same as turbine sensitivity criteria.</li> </ul>	<p>Both the 'No-Go' layer and the 'Very High' sensitivity layers have been applied to the consolidated No-Go maps for precautionary purposes. Development in the very high areas should be avoided as far as possible (only 1% loss of the total very high sensitivity areas within the site is considered acceptable). Therefore, the mapping may reflect minor infringements of infrastructure within such areas and these have been approved by the specialist.</p> <p><b>Overhead power lines:</b> No-Go areas apply specifically to the pylon footprint. An exception to the No-Go areas when an existing overhead powerline bisects a No-Go area; here these can be used for overhead power lines (with any</p>

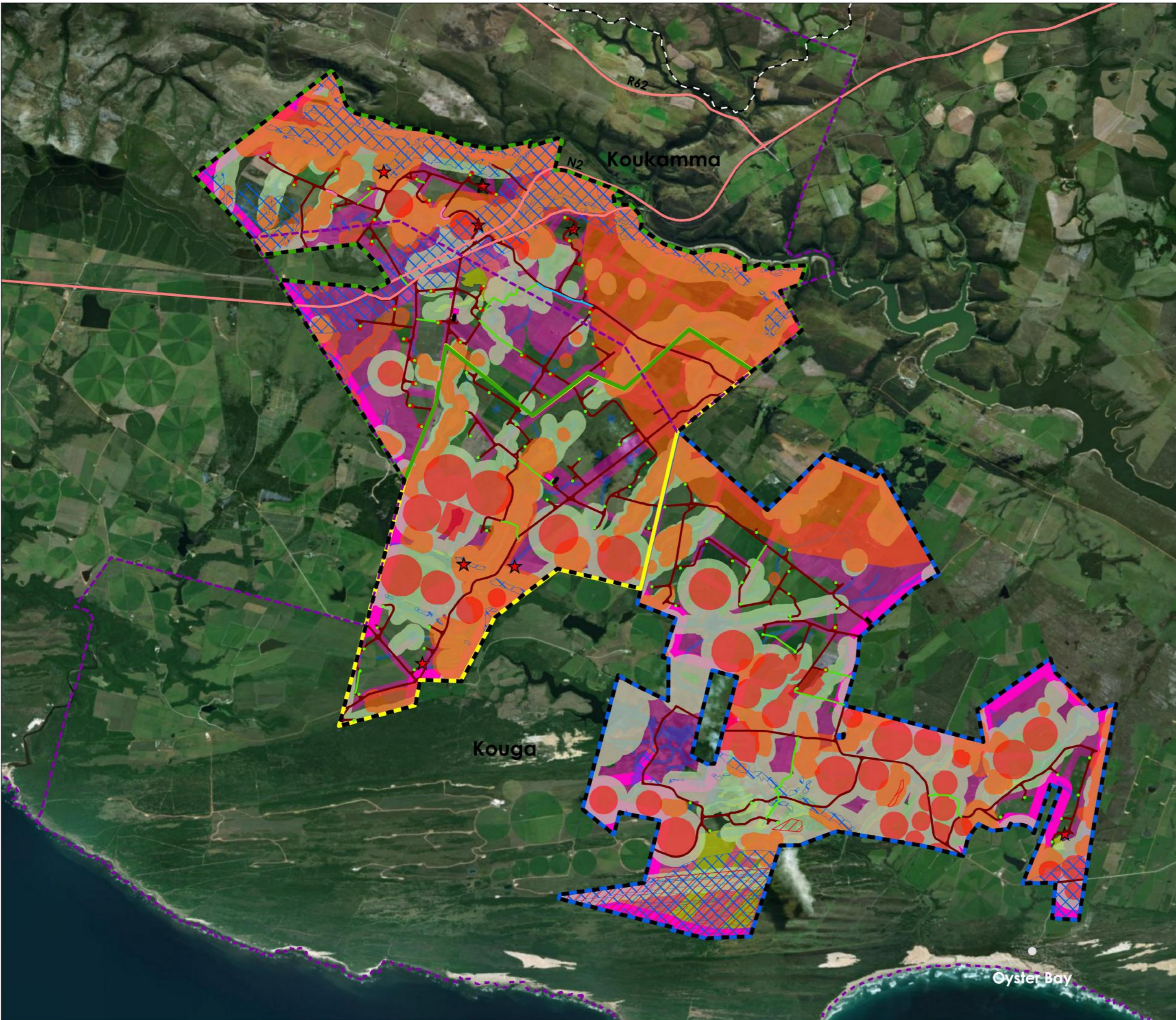
Discipline	No-Go criteria				Notes
	Turbines	Internal overhead power lines	Roads and underground cables	Buildings	
	<ul style="list-style-type: none"> <li>• Very High: Critical and unique habitats that serve as habitat for rare/endangered species or perform critical ecological roles. These areas should be avoided as much as possible. Where these features need to be traversed, existing roads or disturbance footprints should be used as far as possible. A small extent of habitat loss along road edges and similar features is acceptable where avoidance is not possible (1%), but significant impact to these features is usually considered to represent a fatal flaw.</li> </ul>				<p>rehabilitation / monitoring conditions proposed by the specialist).</p> <p><b>Roads and underground cables:</b> The only exception being that when an existing road/ farm track bisects a No-Go area; here these areas can be used for roads and underground cables (with any rehabilitation / monitoring conditions proposed by the specialist).</p>
Aquatic ecology, including geohydrology	<ul style="list-style-type: none"> <li>• Impofu Dam with 50 m buffer</li> <li>• Other dams with 20 m buffer</li> <li>• All wetlands require a minimum of 50 m buffer unless identified as higher by the bird and bat specialists</li> <li>• Artificial dams</li> <li>• Watercourses with 32 m buffer</li> </ul>	<ul style="list-style-type: none"> <li>• Impofu Dam with 50 m buffer</li> <li>• Other dams with 20 m buffer</li> <li>• All wetlands require a minimum of 50 m buffer unless identified as higher by the bird and bat specialists.</li> </ul>	Same as internal overhead power lines sensitivity criteria.	Same as turbine sensitivity criteria.	<p><b>Internal overhead power lines:</b> No-Go areas apply specifically to the pylon footings.</p> <p><b>Roads and underground cables:</b> The only exception when an existing road/ farm track bisects a No-Go area; here these areas can be used for roads and underground cables (with any rehabilitation / monitoring conditions proposed by the specialist).</p>
Birds	<ul style="list-style-type: none"> <li>• Martial eagle nest with a 6 km buffer</li> <li>• Impofu Dam with 600 m buffer</li> <li>• Dams &gt; 1 ha and within priority blue crane areas with a 250 m buffer</li> <li>• High sensitivity wetlands with a 100 m buffer</li> <li>• Mini gorges with a 250 m buffer</li> </ul>	<ul style="list-style-type: none"> <li>• Martial eagle nest with a 1.5 km buffer</li> <li>• Impofu Dam with 600 m buffer</li> <li>• Dams &gt; 1 ha and within priority blue crane areas with a 250 m buffer</li> </ul>	<ul style="list-style-type: none"> <li>• Martial eagle nest with a 1.5 km buffer</li> <li>• High sensitivity wetlands</li> <li>• Mini gorges</li> </ul>	Same as roads and underground cables sensitivity criteria.	<p><b>Roads and underground cables:</b> The only exception when an existing road/ farm track bisects a No-Go area; here these areas can be used for roads and underground cables (with any rehabilitation / monitoring conditions proposed by the specialist).</p> <p><b>Internal overhead power lines:</b> Power lines allowed in Bird No-Go areas in specific cases agreed by the specialist.</p>

Discipline	No-Go criteria				Notes
	Turbines	Internal overhead power lines	Roads and underground cables	Buildings	
		<ul style="list-style-type: none"> <li>• High sensitivity wetlands with a 100 m buffer</li> <li>• Mini gorges with a 250 m buffer</li> </ul>			
Bats	<ul style="list-style-type: none"> <li>• Centre pivots with 200 m buffer</li> <li>• Impofu Dam with 600 m buffer</li> <li>• Klipdrift Dam with 500 m buffer</li> <li>• Tsitsikamma River with 5 km buffer</li> <li>• Klasies River Cave with 10 km buffer</li> <li>• Northern valley with 450 m buffer</li> <li>• Drainage lines, other water bodies and other sensitivities with 200 m buffer</li> <li>• Coastal edge with 500 m buffer</li> </ul> <p>*No-Go areas are those that are deemed critical for resident bat populations, capable of elevated levels of bat activity and support greater bat diversity/activity than the rest of the site. These areas are 'No-Go' zones and turbines may not be placed in these areas and their buffers.</p>	N/A	N/A	N/A	<p><b>Turbines:</b> Buffers for turbines are for the base footprint and include the swept areas. Features used to develop the sensitivity map:</p> <ul style="list-style-type: none"> <li>• Manmade structures, such as buildings, houses, barns and sheds. These structures provide easily accessible roosting sites.</li> <li>• Centre pivots are regularly irrigated and visited by livestock, this attracts insects and therefore insectivorous bats.</li> <li>• The different vegetation types and landform. Valleys and slopes can offer airspace sheltered from wind for insect prey and subsequently attract insectivorous bats. Larger woody shrubs or small trees can offer similar sheltered airspace or offer some roosting spaces.</li> </ul> <p>Open water sources, be it man-made farm dams or seasonal natural areas. They are important sources of drinking water and provide habitat that host insect prey.</p>
Agriculture	<ul style="list-style-type: none"> <li>• Centre pivot irrigation lands</li> </ul>	Same as turbine sensitivity criteria.	Same as turbine sensitivity criteria.	Same as turbine sensitivity criteria.	Overhead power lines can cross centre pivot areas, but there are implications for the line height. There is a minimum distance requirement between the lines and the irrigation equipment, in order to prevent discharge. This means that the lines must be constructed higher than normal over a centre pivot area, which increases the costs associated with line construction.

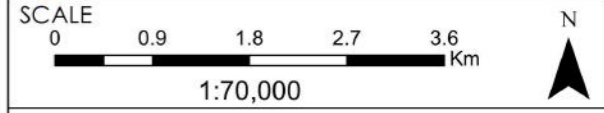


Discipline	No-Go criteria				Notes
	Turbines	Internal overhead power lines	Roads and underground cables	Buildings	
					<b>Roads and underground cables:</b> An exception to the No-Go areas where an existing road / farm tract bisects any No-Go areas, and with the approval of the landowner.
Socio-economic / tourism	N/A	N/A	N/A	N/A	Sensitivities relate to land uses that have economic value such as agriculture.
Archaeology and Palaeontology	<p>Refer to Nillsen (2019) and Almond (2018) for detail:</p> <p><u>General areas:</u></p> <ul style="list-style-type: none"> <li>• SW corner – excluded due to proximity to Geelhoutboom dune area and associated cultural landscape.</li> <li>• SE corner - ‘undisturbed’ dune areas covered by coastal fynbos vegetation to be avoided as there is a higher possibility that <i>in situ</i> archaeological sites/materials will be encountered and possibly damaged/destroyed.</li> </ul> <p><u>Specific sites:</u></p> <p><u>North:</u></p> <ul style="list-style-type: none"> <li>• IN25 (quartzite outcrop)</li> <li>• IN26 (potential graves)</li> <li>• IN27 (isolated grave)</li> <li>• IN31 (Stone Age quarry)</li> <li>• IN32 (low density scatter of MSA / LSA artefacts)</li> <li>• Dense and extensive scatter of Stone Age material (no ref number, shown as star)</li> </ul> <p><u>West</u></p> <ul style="list-style-type: none"> <li>• IW5 (Stone Age Quarry)</li> </ul>	Same as turbine sensitivity criteria.	Same as turbine sensitivity criteria.	Same as turbine sensitivity criteria.	

Discipline	No-Go criteria				Notes
	Turbines	Internal overhead power lines	Roads and underground cables	Buildings	
	<ul style="list-style-type: none"> <li>• IW7 / Q4 (Quarry)</li> <li>• Q3 (Quarry near Rosenhof)</li> <li>• Grave</li> </ul> <p><u>East</u></p> <ul style="list-style-type: none"> <li>• IE8 (Stone Age quarry)</li> <li>• Q1 (Quarry and ESA artefacts)</li> </ul>				
Noise and shadow flicker	N/A	N/A	N/A	N/A	<p>The planning layer for turbines included the following to <i>inter alia</i> avoid noise and shadow flicker impacts:</p> <ul style="list-style-type: none"> <li>• Structures with 500 m buffer</li> </ul> <p>Noise and shadow flicker were modelled after the application of No-Go areas and siting of turbines.</p>
Visual	<ul style="list-style-type: none"> <li>• Landscapes of national scenic value</li> <li>• Water features of national scenic value</li> <li>• 1 km coastal zone</li> <li>• Cultural landscapes of national significance</li> <li>• Nature / Biosphere Reserves - within 2 km</li> <li>• Private reserves / game farms - within 1 km</li> <li>• Settlements / towns - within 1 km</li> <li>• Farmsteads / residences - within 500 m</li> <li>• Scenic routes - within 1 km</li> <li>• National route N2 - within 500 m</li> </ul>	N/A	N/A	N/A	



- Base Data**
- Cities / Towns
  - Major Roads
  - Railways
  - Municipal Boundary
- Proposed Infrastructure**
- Consolidated Impofu Wind Farm Site
  - Impofu East Wind Farm
  - Impofu North Wind Farm
  - Impofu West Wind Farm
  - Turbine Locations
  - Hard Stands
  - Substations
  - Potential Overhead Power Lines
  - Cables alongside Public Roads
  - Off Road Cables
  - Internal Roads including Cables
  - Potential Site Camp/Laydown Areas
- No-Go Areas**
- Agricultural
  - Aquatic
  - Archaeology and Palaeontology
  - ★ Archaeology and Palaeontology Sites
  - Bat
  - Bird
  - Planning
  - Terrestrial Ecology
  - Visual

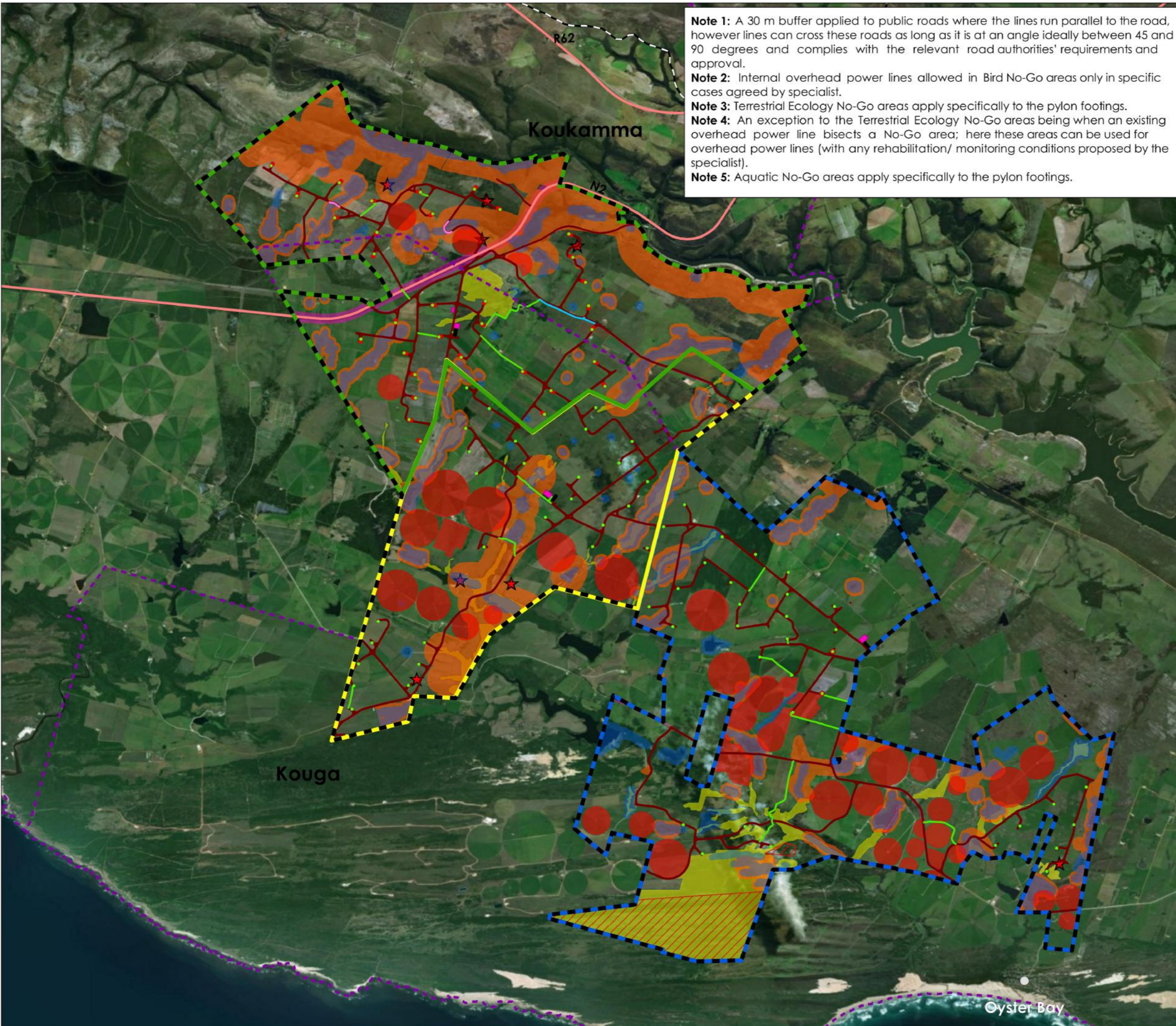


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**Impofu Wind Farms**

*Turbine Consolidated No-Go Map*



**Note 1:** A 30 m buffer applied to public roads where the lines run parallel to the road, however lines can cross these roads as long as it is at an angle ideally between 45 and 90 degrees and complies with the relevant road authorities' requirements and approval.

**Note 2:** Internal overhead power lines allowed in Bird No-Go areas only in specific cases agreed by specialist.

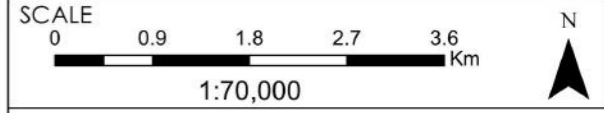
**Note 3:** Terrestrial Ecology No-Go areas apply specifically to the pylon footings.

**Note 4:** An exception to the Terrestrial Ecology No-Go areas being when an existing overhead power line bisects a No-Go area; here these areas can be used for overhead power lines (with any rehabilitation/ monitoring conditions proposed by the specialist).

**Note 5:** Aquatic No-Go areas apply specifically to the pylon footings.



- Base Data**
- Cities / Towns
  - Major Roads
  - Railways
  - ▭ Municipal Boundary
- Proposed Infrastructure**
- ▭ Impofu East Wind Farm
  - ▭ Impofu North Wind Farm
  - ▭ Impofu West Wind Farm
  - ▭ Wind Farms Site Boundary
  - Turbine Locations
  - Hard Stands
  - ▭ Substations
  - Potential Overhead Power Lines
  - Cables alongside Public Roads
  - Off Road Cables
  - Internal Roads including Cables
  - ▭ Potential Site Camp/Laydown Areas
- No-Go Areas**
- ▭ Agricultural
  - ▭ Aquatic
  - ▭ Archaeology and Palaeontology
  - ★ Archaeology and Palaeontology Sites
  - ▭ Bird
  - ▭ Planning
  - ▭ Terrestrial Ecology

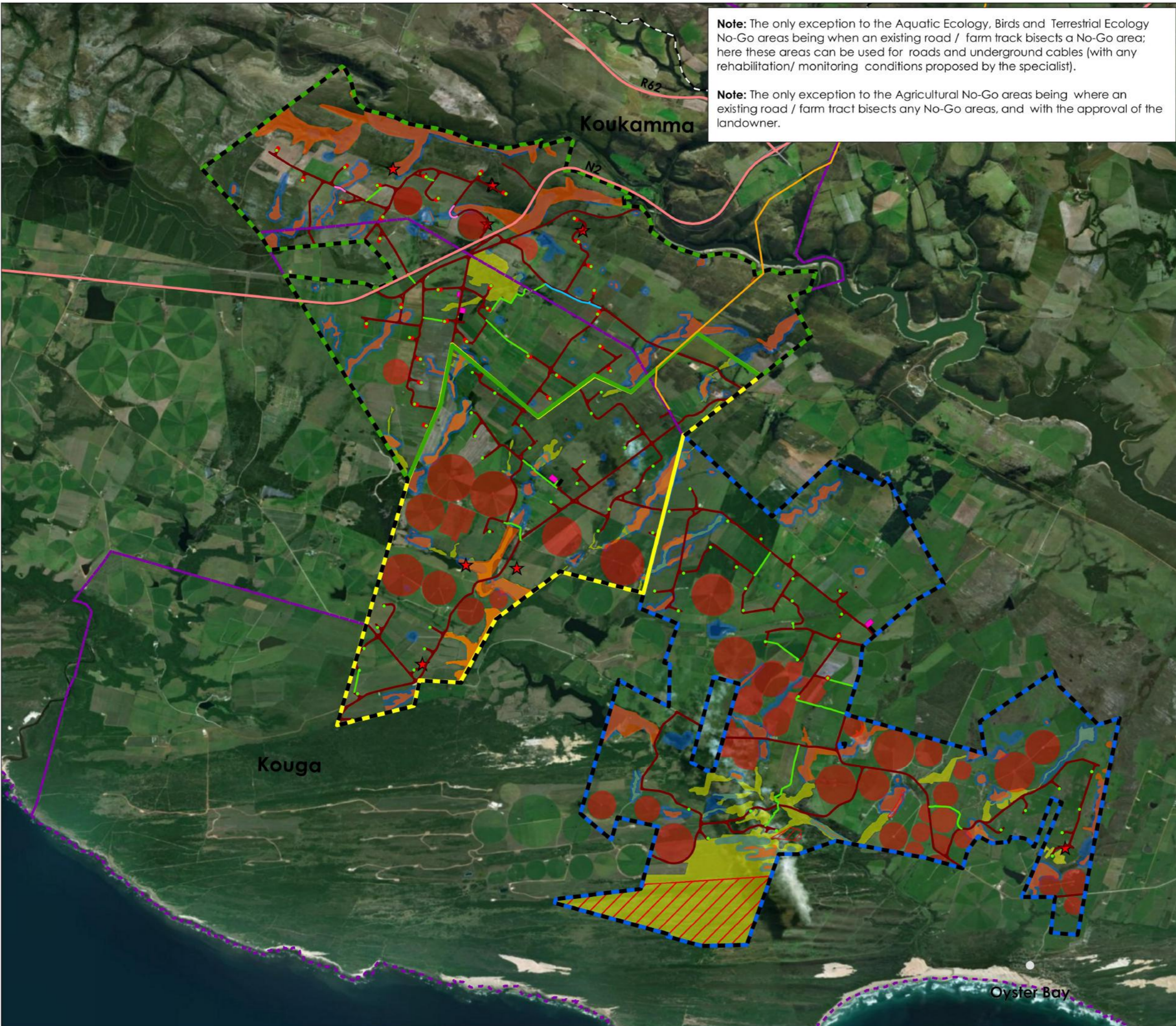


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**Impofu Wind Farms**

*Internal Overhead Lines  
 Consolidated No-Go Map*

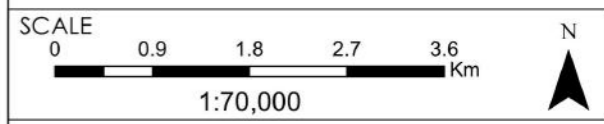


**Note:** The only exception to the Aquatic Ecology, Birds and Terrestrial Ecology No-Go areas being when an existing road / farm track bisects a No-Go area; here these areas can be used for roads and underground cables (with any rehabilitation/ monitoring conditions proposed by the specialist).

**Note:** The only exception to the Agricultural No-Go areas being where an existing road / farm tract bisects any No-Go areas, and with the approval of the landowner.



- Base Data**
- Cities / Towns
  - Major Roads
  - Railways
  - ▭ Municipal Boundary
- Proposed Infrastructure**
- ▭ Impofu East Wind Farm
  - ▭ Impofu North Wind Farm
  - ▭ Impofu West Wind Farm
  - ▭ Wind Farms Site Boundary
  - Turbine Locations
  - Hard Stands
  - Substations
  - Potential Overhead Power Lines
  - Cables alongside Public Roads
  - Off Road Cables
  - Internal Roads including Cables
  - ▭ Potential Site Camp/Laydown Areas
- No-Go Areas**
- Agricultural
  - Aquatic Ecology
  - ▨ Archaeology and Palaeontology
  - ★ Archaeology and Palaeontology Sites
  - Terrestrial Ecology



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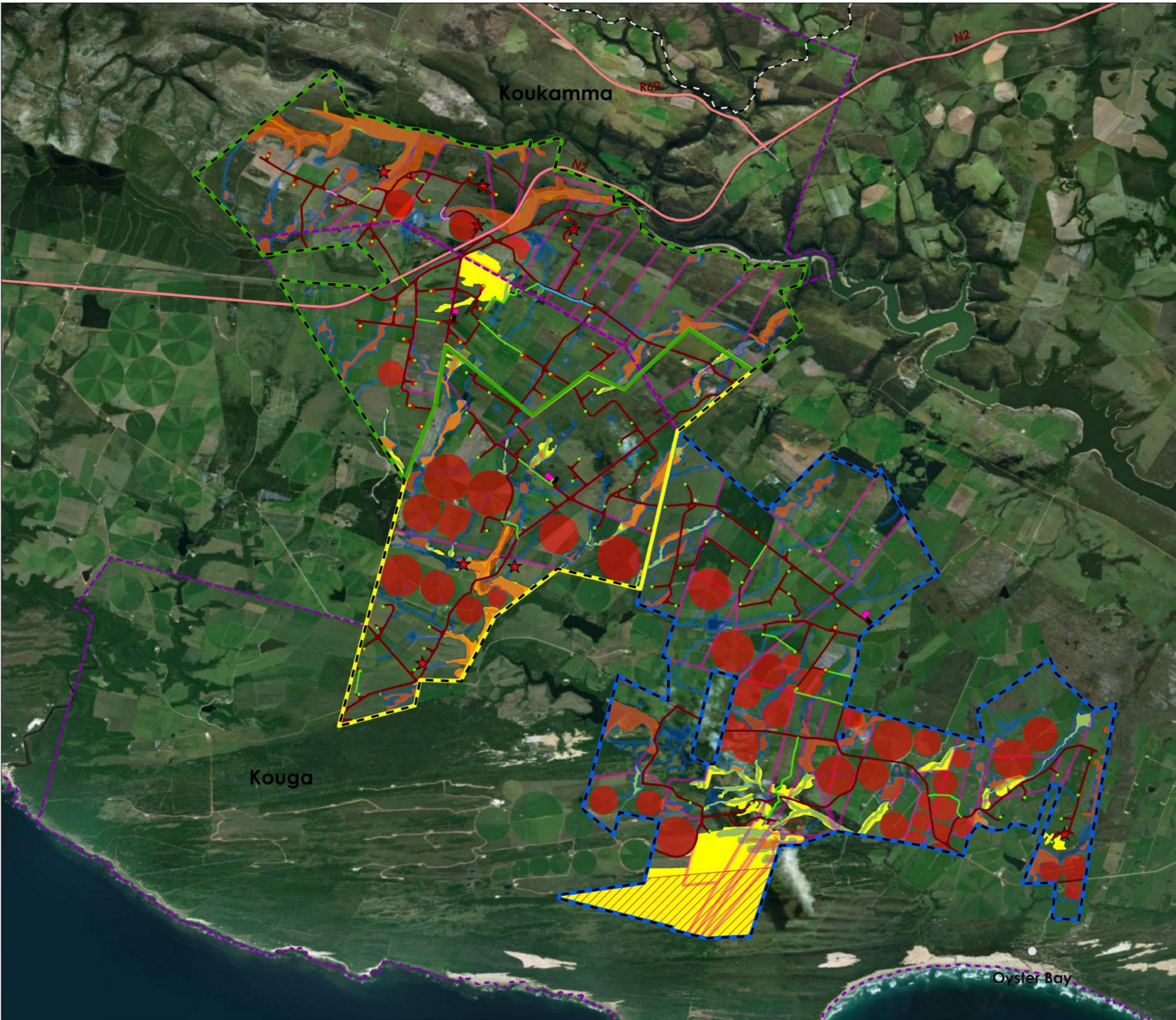
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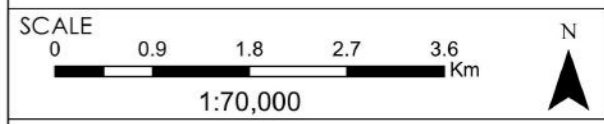
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## Impofu Wind Farms

*Roads and Cables  
Consolidated No-Go Areas Map*



- Base Data**
- Cities / Towns
  - Major Roads
  - Railways
  - ▭ Municipal Boundary
- Proposed Infrastructure**
- ▭ Impofu East Wind Farm
  - ▭ Impofu North Wind Farm
  - ▭ Impofu West Wind Farm
  - ▭ Wind Farms Site Boundary
  - Turbine Locations
  - Hard Stands
  - Substations
  - Potential Overhead Power Lines
  - Cables alongside Public Roads
  - Off Road Cables
  - Internal Roads including Cables
  - ▭ Potential Site Camp/Laydown Areas
- No-Go Areas**
- Agricultural
  - Aquatic
  - ▨ Archaeology and Palaeontology
  - ★ Archaeology and Palaeontology Sites
  - Bird
  - Planning
  - Terrestrial Ecology



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# Impofu Wind Farms

*Buildings Consolidated No-Go Map*

# Appendix F3

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## Method Statements

# METHOD STATEMENT

**CONTRACT:** .....

**DATE:** .....

**PROPOSED ACTIVITY** (give title of method statement and reference number from the EMPr):

--

**WHAT WORK IS TO BE UNDERTAKEN** (give a brief description of the works):

1.
----

**WHERE ARE THE WORKS TO BE UNDERTAKEN** (where possible, provide an annotated plan and a full description of the extent of the works):

--

**WHAT MATERIALS WILL BE USED?**

--

**WHAT TYPE OF EQUIPMENT/MACHINERY WILL BE USED?**

--

**START AND END DATE OF THE WORKS FOR WHICH THE METHOD STATEMENT IS REQUIRED:**

<b>Start Date:</b>	<b>End Date:</b>
--------------------	------------------



**HOW ARE THE WORKS TO BE UNDERTAKEN?** (provide as much detail as possible, including annotated sketches/ plans where possible):



\*Note: please attach extra pages if more space is required

## **DECLARATIONS**

### **1) CONTRACTOR**

I understand the contents of this Method Statement and the scope of the works required of me. I further understand that this Method Statement may be amended on application to other signatories and that the ER will audit my compliance with the contents of this Method Statement

---

Signed

Print name

Dated

### **2) ENVIRONMENTAL CONTROL OFFICER**

The work described in this Method Statement, if carried out according to the methodology described, is satisfactorily mitigated to prevent avoidable environmental harm:

---

Signed

Print name

Dated

### **3) RESIDENT ENGINEER**

The works described in this Method Statement are approved.

---

Signed

Print name

Designation

Dated: \_\_\_\_\_

# Appendix F4

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Training

ENVIRONMENTAL AWARENESS COURSE  
JUNE 2018  
AURECON PROJECT: aurecon



**ENVIRONMENTAL AWARENESS COURSE**

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**WHAT IS THE ENVIRONMENT?**

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

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**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. stop works or fines issued)

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**HOW DO WE LOOK AFTER THE ENVIRONMENT?**

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

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**WORKING AREAS**

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




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**RIVERS & STREAMS**

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



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**DUST**

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












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**NOISE**

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










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**SMOKING AND FIRE**

- Put cigarette butts in a rubbish bin
- Do not smoke near gas, paints or petrol
- Do not light any fires
- Know the positions of fire-fighting equipment
- Report all fires
- Don't burn rubbish/vegetation








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**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 contents

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**ANIMALS**

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





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**TREES AND FLOWERS**

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






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**EMERGENCY PHONE NUMBERS**

- Know all the emergency phone numbers:
- Heritage Western Cape
- Environmental Control Officer
- Site Environmental Officer
- Resident Engineer




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**FINES AND PENALTIES**

- Spot fines of between R 20 and R 2000
- Your company may be fined
- Removal from site
- Construction may be stopped




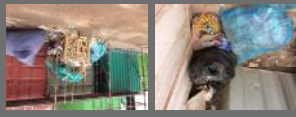
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**RUBBISH**

- 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

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**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 especially when crossing the river




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**TOILETS**

- Use the toilets provided
- Report full or leaking toilets






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**EATING**

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

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- Report any breaks, floods, fires, spills and leaks to your supervisor
- Don't make ASSUMPTIONS!
- Ask questions!



## PROBLEMS - WHAT TO DO!

# Appendix F5

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## Management Plans



**IMPOFU EAST WIND FARM:  
PLANT RESCUE & PROTECTION PLAN**



**PRODUCED FOR RED CAP IMPOFU EAST (PTY) LTD**

**BY**



**[Simon.Todd@3foxes.co.za](mailto:Simon.Todd@3foxes.co.za)**

**APRIL 2019**

## ***MANAGEMENT PLAN OBJECTIVES***

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The purpose of the Impofu East Wind Farm plant rescue and protection plan is to implement avoidance and mitigation measures to reduce the impact of the development of the Impofu East Wind Energy Facility on listed and protected plant species and their habitats during construction and operation. This subplan is a requirement of the EIA process and is also required in order to ensure compliance with national and provincial legislation for vegetation clearing and any required destruction or translocation of provincially and nationally protected species within the footprint of the Wind Farm.

The Plan first provides some legislative background on the regulations relevant to listed and protected species, followed by a summary of the protected species and genera as listed by the relevant legislation and then an identification of species present at the Impofu site and actions that should be implemented to minimise impact on these species and comply with legislative requirements.

## ***IDENTIFICATION OF SPECIES OF CONSERVATION CONCERN***

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Plant species are protected at the national level as well as the provincial level and different permits may be required for different species depending on their protection level. At the national level, protected trees are listed by DAFF under the National List of Protected Trees, which is updated on a regular basis. Any clearing of nationally protected trees requires a permit from DAFF. At the provincial level, all species red-listed under the Red List of South African plants (<http://redlist.sanbi.org/>) are protected. The provincial legislation of the Eastern Cape is however out of date and there is not currently a comprehensive provincial legislation available. However, the following acts are considered applicable: Transkei Environmental Conservation Decree 9 of 1992, Ciskei Nature Conservation Act 1987 and the Cape Nature and Environmental Conservation Ordinance 19 of 1974. These acts and ordinances list a variety of protected plant species that may not be impacted without a permit. It is important to note that authorisation of the project by DEA does not free the developer from complying with the provincial legislation and permitting requirements with regards to protected species.

## ***MITIGATION & AVOIDANCE OPTIONS***

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The primary mitigation and avoidance measure that must be implemented at the preconstruction phase is the Preconstruction Walk-Through of the development footprint. This

defines which and how many individuals of listed and protected species are found within the final development footprint. While some turbine and road micro-siting at this stage is possible, some impact on protected and listed species is generally inevitable. The walk-through should provide a reliable estimate of the number of listed and protected species that occur within the development footprint and which cannot be avoided. This information is required for the DAFF (if required) and Eastern Cape Nature Conservation permits which must be obtained before construction can commence.

Where listed plant species fall within the development footprint and avoidance is not possible, then it may be possible to translocate the affected individuals outside of the development footprint. However, not all species are suitable for translocation as only certain types of plants are able to survive the disturbance. Suitable candidates for translocation include most geophytes and succulents. Although there are exceptions, the majority of woody species do not survive translocation well and it is generally not recommended to try and attempt to translocate such species. Recommendations in this regard would be made following the walk-through of the facility footprint before construction, where all listed and protected species within the development footprint will be identified and located.

## ***RESCUE AND PROTECTION PLAN***

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### **Preconstruction**

- Identification of all listed species which may occur within the site, based on the SANBI SIBIS database as well as the specialist EIA studies for the site and any other relevant literature.

Before construction commences at the site, the following actions should be taken:

- A walk-through of the final development footprint by a suitably qualified botanist/ecologist to locate and identify all listed and protected species which fall within the development footprint. This should happen during the flowering season at the site which depending on rainfall is likely to be during spring to early summer (August-October).
- A walk-through report following the walk-through which identifies areas where minor deviations to roads and other infrastructure can be made to avoid sensitive areas and important populations of listed species. The report should also contain a full list of localities where listed species occur within the development footprint and the number of affected individuals in each instance, so that this information can be used to comply

with the permit conditions required by the authorization as well as provincial requirements.

- A permit to clear the site and relocated species of concern is required from Eastern Cape Nature & Conservation before construction commences. There are also listed tree species present at the site and a permit from DAFF to clear protected trees may also be required.
- Once the required permits have been issued, there should be a search and rescue operation of all listed species which have been identified in the walk-through report as being suitable for search and rescue within the development footprint that cannot be avoided. Affected individuals should be translocated to a similar habitat outside of the development footprint and marked for monitoring purposes. Those species suitable for search as rescue should be identified in the walk-through report. It is important to note that a permit is required to translocate or destroy any listed and protected species even if they do not leave the property.
- It is generally not recommended to house rescued plants within a nursery or similar facility. Plants should ideally be translocated directly from their current location to their final destination.

### **Construction**

- Vegetation clearing should take place in a phased manner, so that large cleared areas are not left standing with no activity for long periods of time and pose a wind and water erosion risk. This will require coordination between the contractor and ECO, to ensure that the ECO is able to monitor activities appropriately.
- All cleared material should be handled according to the Revegetation and Rehabilitation Plan and used to encourage the recovery of disturbed areas.
- ECO to monitor vegetation clearing at the site. Any deviations from the plans that may be required should first be checked for listed species by the ECO and any listed species present which are able to survive translocation should be translocated to a safe site.
- All areas to be cleared should be demarcated with construction tape, survey markers or similar. All construction vehicles should work only within the designated area.
- Plants suitable for translocation or for use in rehabilitation of already cleared areas should be identified and relocated before general clearing takes place.
- Any listed species observed within the development footprint that were missed during the preconstruction plant sweeps should be translocated to a safe site before clearing commences.

- Many listed species are also sought after for traditional medicine or by collectors and so the ECO should ensure that all staff attend environmental induction training in which the legal and conservation aspects of harvesting plants from the wild are discussed.
- The ECO should monitor construction activities in sensitive habitats such as in dune areas carefully to ensure that impacts to these areas are minimized.

### **Operation**

- Access to the site should be strictly controlled and all personnel entering or leaving the site should be required to sign and out with the security officers.
- The collecting of plants or their parts should be strictly forbidden and signs stating so should be placed at the entrance gates to the site.

## ***MONITORING & REPORTING REQUIREMENTS***

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The following reporting and monitoring requirements are recommended as part of the plant rescue and protection plan:

- Preconstruction walk-through report detailing the location and distribution of all listed and protected species. This should include a walk-through of all infrastructure including all new access roads, turbine locations, turbine service areas, underground cables, power line routes, buildings and substations. The report should include recommendations of route adjustments where necessary, as well as provide a full accounting of how many individuals of each listed species will be impacted by the development.
- Permit application to Eastern Cape Nature & Conservation and DAFF as required. This requires the walk-through report as well as the identification and quantification of all listed and protected species within the development footprint. The permit is required before and search and rescue can take place. Where large numbers of listed species are affected a site inspection and additional requirements may be imposed by Eastern Cape Nature & Conservation or DAFF as part of the permit conditions. All documentation associated with this process needs to be retained and the final clearing permit should be kept at the site.
- Active daily monitoring of clearing during construction by the ECO to ensure that listed species and sensitive habitats are avoided. All incidents should be recorded along with the remedial measures implemented.

- Post construction monitoring of plants translocated during search and rescue to evaluate the success of the intervention. Monitoring for a year post-transplant should be sufficient to gauge success.
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## **Impofu East Wind Farm Alien Management Plan**

All alien invasive species and declared weeds, in terms of the Conservation of Agricultural Resources Act, Act 43 of 1983, are to be systematically eradicated, and any of these species colonising disturbed ground after the completion of construction are to be eradicated and destroyed prior to attaining the seed formation phase.

As with any document relating to construction - the Alien Management Plan must be continually monitored and updated as the site construction develops and conditions/findings on site change.

- a) The following provides guidelines for onsite alien plant management. The appropriate alien management strategy pertinent to the situation/environment should be identified and implemented.
- b) Alien Plant Management plan to commence in a phased manner in parallel with construction phases.
- c) The Alien Plant Management Plan for alien vegetation includes three phases:
  - I. **Initial control:** drastic reduction of the existing population;
  - II. **Follow-up control:** reduction of seedlings, root suckers and coppice growth;
  - III. **Maintenance control:** sustain low alien plant numbers/density with low annual costs. At this phase, alien plants must no longer be considered a problem. Monitor the situation two-three times each year (spring, mid-summer and autumn) to avoid alien plant re-infestation, spread and densification, and thereby avoid increased control costs.

### **Initial Control**

#### ***1. Fell trees - control stumps - plant grass (such as Rooikrantz, Black Wattle, Bugweed & Port Jackson)***

- a) Fell trees, treat stumps, remove wood and plant grass. This strategy is suitable where infestations are easily accessible and can be harvested (i.e. for firewood, charcoal, building materials, mulch production). It is also suitable for trees that need removal for utility or aesthetic purposes or where they pose a potential hazard to waterways, building structures, etc.
- b) **Control Method for trees:** Use chainsaws, bow saws, brush cutters or cane knives to fell trees and saplings. Stump height should be less than 15 cm. Apply a registered herbicide mix with hand sprayers, paint brushes or knapsack sprayers at low pressure, using solid cone nozzles. Use a suitable dye to ensure that stumps are not missed.
  - I. **Cut stump treatment:** Apply the recommended herbicide mixed in water to the cut surface of stumps. Do NOT spray the sides of stumps. Apply herbicide mix up to one hour after felling or the cut wood will seal.

- II. **Total Stump treatment:** Apply the recommended herbicide mixed in diesel to the cut surface, down the sides of stumps and to any exposed roots. The herbicide mix can be applied even several days after felling. Ensure herbicide can be mixed with diesel.
  - III. **Stump treatment with herbicide plugs:** After felling, make holes in the stumps and insert plugs containing the herbicide, which is released into the stumps.
- c) Control method for seedlings, saplings and coppice: In a mixed age stand, where there are young plants and coppice growth, cut the plants with a brush cutter and treat the stumps. Hand pull seedlings. Do not spray foliage as many plants may be damaged during felling and may not absorb enough of the herbicide for effective control. Untreated plants can be controlled with foliar herbicide during follow-up work.
  - d) Disposal of brushwood: Where wild fires are a potential hazard, spread out the brushwood evenly over a large area. Avoid large heaps as this is a fire hazard and burning will cause breakdown of the soil structure. Trees that cannot be utilised should be controlled standing to avoid burning large amounts of wood lying on the soil surface.
  - e) Rehabilitation: Sow grass in the bare soil around the stumps immediately after the first reliable rains. Spread brushwood over the buried grass seed to aid seedling establishment. Brushwood can be used as fences/barriers and pegged to stabilise slopes where necessary.

## 1 **Control for shrubs (such as *Lantana camara*)**

### a) **Alien shrubs less than 1 m tall**

- I. Foliar application of a registered herbicide is required.
- II. Where grass is present use selective broadleaf herbicides that do not harm the grass.
- III. Where grass is absent, use selective or non-selective herbicides.
- IV. When dense seedling growth of uniform height is present use knapsack sprayers with flat fan nozzles.
- V. Use solid cone nozzles for seedlings of uneven height, coppice growth, root suckers and short saplings.

### b) **Alien shrubs taller than 1 m**

- I. **Mechanical Control pre-treatment:** Where shrubs are taller than 1.5 m, the height must be reduced by cutting, using sharpened hoes, cane knives or motorised brush cutters. For large areas of dense growth, use a tractor-mounted gyro-mower (set as low as possible) after slashing or cutting plants, either treat the freshly cut stumps or allow re-growth to knee height and then spray with a suitable registered herbicide.
- I. **Cutting for stump treatment:** This is suitable for low - medium density infestations but is usually not practical for high density infestations. Slash plants



below 15 cm in height for stump application. Control the stumps immediately after cutting the plants. Stump application is best during the active growing season.

- II. **Cutting from coppice treatment:** This is suitable for medium - high density infestations. Slash plants at a convenient height (e.g. knee height for foliar application to coppice re-growth. Cutting dense plants is good winter work but is tiring so must be well organised. Spray coppice re-growth during the active growing season, when there is enough leaf cover to absorb the herbicide.
  - III. **Flattening:** Roll empty 200L metal drums or place large pieces of corrugated iron to make paths through dense thickets of plants (e.g. Bramble). This increases access for foliar or stump application.
  - IV. **Cut pathways:** This increases access for control work.
  - V. **Mechanical uprooting:** Uprooting of shrubs with mattocks results in soil disturbance, especially where large plants are present in dense thickets. Use only where not susceptible to erosion or where soil can be stabilised effectively.
- c) **Disposal of small amounts of cut material:** Small amounts of cut top growth material do not impede access for follow-up control work. Leave the material to act as a mulch and to decompose, or spread over planted grass seed to aid seedling establishment. This adds organic material to the soil.
- d) **Disposal of large amounts of cut material:** Cut the plants and use long poles/branches to roll the material away from stumps. Where cut material hampers access for follow-up control, roll into heaps and burn. Alternatively, spread large amounts of cut material over a large area for a cool burn. This avoids hot intense fires that would destroy the soil surface. Burn during the wet season for a cooler burn.

Rehabilitation: Avoid sowing on compacted soil or soil with a 'crust' as the seed will be washed away after the first rains. In such cases light soil disturbance is necessary e.g. using rakes for broadcast sowing or sharp-pointed hoes for row sowing. Sow suitable grass species on bare soil. Cover the buried seed with small amounts of cut top growth material to aid grass establishment. The material retains moisture in the soil, traps soil after heavy rains, and by rotting contributes organic material to the soil to aid seedling establishment.

## **2 Chemical control of alien herbs:**

- a) There are many herbaceous alien (soft/non-woody) species present and likely to occur sporadically throughout the operational phase of the development.
- b) Alien herbs are called *broadleaf weeds* and some have pre and post-emergent herbicides registered for their control.
- c) However, where alien herbs are associated with woody alien plants, herbicides registered for control of woody aliens are often also used for control of broadleaf weeds.
- d) Alternatively, glyphosate is used, as this is often registered for both woody and non-woody species. Glyphosate is a post-emergent (foliar applied) herbicide that is inactivated by soil.

Rehabilitation: Alien herbs usually occur in disturbed areas, where rehabilitation is not generally a high priority. However in some situations, rehabilitation with grass is required for control of alien herbs. Rehabilitation is required, for example, after control of thickets of *Bidens* species (black jacks) and *Tagetes minuta* (Khakibos) is controlled prior to planting summer grasses.

Perennial grasses can are often planted after a disturbance to stabilise the soil and suppress alien herbs. Alternatively creeping species that have good soil binding ability prevent erosion. Planting a quick-growing grass on bare soil results in a dense rapid cover that successfully competes with establishing alien herbs.

### **Follow-up control**

Follow up control of alien seedlings, saplings and coppice re-growth is essential to achieve and sustain the progress made with initial control work. If this phase is neglected, the cleared area will soon become infested with dense alien vegetation again, arising either from re-invasion by the original species or from invasion/encroachment by another species. Follow-up control is essential to prevent alien seedlings suppressing planted or colonizing grasses. Before starting initial control operations in new infestations, all required follow-up control and rehabilitation work must be completed or in progress in areas initially prioritised for clearing and rehabilitation.

Follow-up control should combine the following methods:

- a) Chemical control methods (always use registered herbicides);
- b) Mechanical control methods, and
- c) Available biological control agents

Evaluate and select methods for follow-up control work according to species, and the type and density of re-growth.

### **1. Control methods for dense re-growth**

Dense re-growth may arise after initial control operations, as seedlings, root suckers or stump coppices. For example wattle seedlings are stimulated to germinate after fire or seedlings may arise from a high seed bank in the soil.

- a) Do not uproot or hoe out dense seedlings. This would result in soil disturbance that promotes germination and flushes of alien seed growth.
- b) Do not cut plants to control stumps where stump density is high. Stump application would be impractical with many untreated stumps.
- c) Instead cut tall dense re-growth with brush cutters or bush knives. Remove top growth to allow access for foliar spray of coppice re-growth.
- d) Burn high fuel loads of grass below the alien plant infestations. The fire spreads into the infestations, kills many seedlings and opens up access to the infestations. Spot spray coppice re-growth of plants that survive burning.
- e) Livestock graze palatable seedlings (e.g. wattle), thereby effectively removing most of the seedlings. Plant grass after the area has been cleared of competition from dense alien seedlings.

## 2. Control methods for low-medium density re-growth

Areas with low-medium density re-growth are considered high priority for control as neglect of these areas will result in densification and spread that is more costly to control. Large areas of low density growth can be controlled rapidly

- a) **Cut plants and control the stumps:** Stump height should be less than 15 cm. Use a recommended registered herbicide. Apply the herbicide mix with hand sprayers, paint brushes or knapsack sprayers at low pressure, using solid cone nozzles. Use a suitable dye to ensure no stumps are missed. For cut stump treatment, apply the herbicide mixed in water to the cut surface of stumps. Do NOT spray the sides of the stumps. Apply the herbicide within 1 hour of cutting the plants before the wound seals. For total stump treatment, apply a herbicide mixed with diesel to the cut surface, down the sides of stumps and to exposed roots. The herbicide mix can be applied up to several days after cutting the plants.
- b) **Foliar spray on coppice re-growth and saplings:** Re-growth can be sprayed up to a height of 1 m. Apply the herbicide in knapsack sprayers using solid cone nozzles with a suitable dye to avoid over- or under-spraying.
- c) **Mechanical control options:**
  - I. Hand pull seedlings when the soil is wet, using gloves to protect the hands.
  - II. Grazing will kill palatable seedlings as grass is utilised.
  - III. Burn grass to control saplings - the control burning of high grass fuel loads is another option in an integrated control programme. Any burning must be done in a controlled, safe manner and according to local burning regulations. Protect neighbouring veld during the burn. Fire can destroy the seedlings of invader species and increase the competitive ability of the grass sward. The control of saplings can only be effective if the fuel load is high. Aim for at least 10 tons of grass per hectare in dry areas and 5 tons per hectare in moist areas. Rest the veld for a period prior to the burn to ensure the accumulation of sufficient fuel loads and burn when conditions will favour a hot fire. Fire alone will not kill the trees, it only kills top growth. Many shrubs and trees coppice after burning. Treat any coppice growth with herbicides. If this is not done, the coppices will form multi-stemmed plants.

### **Maintenance Control**

Aim to keep the area stabilised by maintaining a good grass cover. Prevent further soil disturbance. Planted grass must be maintained as a healthy mat to achieve the aims of rehabilitation. If the grass is neglected, it can become rank and moribund or suppressed by alien plant seedlings. Annual inspection of grass cover and alien plant re-growth is essential. Follow-up and maintenance control work each year will protect the planted grass cover. If this is neglected, the rehabilitated area will revert to dense patches of alien plants, resulting in increased control costs and loss of grass cover.

To keep grass healthy:

- a) Use correct animal stocking rates to avoid loss of palatable grass vigour and long-term replacement with unpalatable species in open space areas.
- b) Use correct burning frequency and timing of burns in open space areas to allow grasses between 1 and 3 years to become established.

c) Follow-up control work is essential using appropriate measures.

### **Integrated Control**

Areas should be ranked into high, medium and low priority work areas, where high priority areas would be controlled first.

#### **1. High Priority Areas for control**

##### **a) Low density infestations**

- I. Start maintenance control in areas with low alien plant numbers, targeting especially mature seed-producing trees (identifiable by the presence of flowers during the flowering season and/or presence of seed), or parent trees that are a source of seed to the site. This may include trees outside of the site, within a minimum of 100 m from the site boundary.
- II. Maintenance control is rapid and cost effective.
- III. This will protect the grass that is already there, prevent formation of thickets, and halt encroachment (spread) of alien plants into surrounding areas.

##### **b) Areas near the top of slopes, water courses, steep bare slopes or long bare slopes**

- I. Start control at the top end of water courses or at the top of slopes.
- II. This prevents seed spreading downstream or downhill to infest new areas.
- III. Plant grasses on bare soil, especially on steep slopes or long bare slopes, to prevent erosion.

##### **c) Areas where initial control work is completed and re-growth is present**

- I. Complete major follow-up control and rehabilitation work in all areas before starting initial control in new infestations.
- II. Control of seedlings protects newly planted grass.
- III. Failure to control re-growth results in densification and spread of infestations, with increased control and loss of grass cover.
- IV. Continued maintenance is a long-term on-going exercise to prevent re-infestation.

##### **d) Newly disturbed areas**

- I. Areas where mechanical disturbance (such as removal of alien plants), loss of grass cover or where intense uncontrolled fires occurred provides an ideal seed bed for pioneer alien plant seedling establishment.
- II. This re-growth should be controlled while still less than 0.5 m tall.
- III. If this is neglected, re-growth will become taller and more dense, resulting in more costly control work and loss of grass cover.

##### **e) Edges of dense spreading infestations**

- I. Confine infestations when there are insufficient funds to control the whole infestation and where the alien plants are likely to spread and invade neighbouring areas.

- II. To prevent spread, control trees, saplings, seedlings, coppice re-growth or shrubs in a 5 - 10 m wide strip around the edges of such infestations to confine them.
- III. Move inwards from the edges with control work as funds become available.

**f) Low density areas inside dense infestations**

- I. Thin inside infestations to prevent densification (i.e. control all low-density areas inside the infestations to encourage grass growth. This will break up the large infestations into several smaller infestations that are more easily controlled.
- II. Grass will gradually spread into the controlled areas as the alien plants die or are removed. The direction of grass spread therefore follows the control work, as the alien plants die. Sow grass seed in bare soil for a more rapid ground cover, especially on steep slopes or on easily eroded soil.
- III. Monitor confined and thinned infestations 2 - 3 times each year. Repeat follow-up control operations as required, to ensure the controlled areas remain clear of re-growth and that the planted grass has established and remains healthy. Seedling re-growth will be evident in spring and early summer while re-growth and coppice will be easily observed in summer. When a re-infestation is observed it should be controlled immediately.

**2. Low priority areas for control**

- a) Stabilised areas where there is a healthy dense grass cover, and any alien plants are very sparse, difficult to detect and with little or no impact at present. Monitor alien plant growth and grass cover 2-3 times a year to ensure timely maintenance work.
- b) Areas where dense infestation could become worse. Confine these dense infestations to prevent spread into new areas.
- c) Areas where alien plants have little or no impact.

Thus, **high priority** areas are identified where resources should be concentrated to achieve the desired aims. Control in these areas gives the greatest total benefit, and allows the best use of the limited available resources.

The **low priority** areas would consume resources with little benefit, and should therefore be ignored or re-evaluated each year for attention at a later date.

## **APPENDIX 4. DURING & POST CONSTRUCTION BIRD MONITORING PROGRAMME**

The work done to date on the Impofu Wind Farms site has established a baseline understanding of the distribution, abundance and movement of key bird species on and near the site. However this is purely the 'before' baseline and aside from providing input into turbine micro-siting, it is not very informative until compared to post construction data. The following programme has therefore been developed to meet these needs. It is recommended that this programme be implemented by the Impofu East Wind Farm if constructed.

### **During construction monitoring**

It will be necessary to monitor the breeding status and productivity of the Martial Eagle pair during all breeding seasons during construction. This can be done by a minimum of 3 specialist visits to the nest site per breeding season, or close enough to observe the eagles without disturbing them. Detailed requirements as follows:

- Independent avifaunal specialist to make 3 visits to nest site in each breeding season (May to October) during construction.
- Breeding status & productivity to be determined.
- Any response by eagles to construction disturbance to be documented.

### **Post construction monitoring**

The intention with post construction bird monitoring is to repeat as closely as possible the methods and activities used to collect data pre-construction. This work will allow the assessment of the impacts of the proposed facility and the development of active and passive mitigation measures that can be implemented in the future where necessary. One very important additional component needs to be added, namely mortality estimates through carcass searches under turbines. The following programme has therefore been developed to meet these needs, and should start as soon as possible after the operation of the first phase of turbines (not later than 3 months):

Note that this framework is an interim draft. The most up to date version of the best practice guidelines (Jenkins *et al* 2015) should inform the programme design at the time.

### **Live bird monitoring**

Note that due to the construction of the wind farm and particularly new roads it may be necessary to update the location of the below monitoring activities from those used pre-construction.

- » The 15 walked transects of 1km each that have been done during pre-construction monitoring on the overall Impofu Wind Farms site should be continued. On Impofu East specifically 6 walked transects of 1km each should be done.
- » The 7 vehicle based road count routes on the overall Impofu Wind Farms should be continued, and conducted twice on each site visit. On Impofu East specifically four drive transects should be done, transects 4, 5, 6, and 7.
- » The 14 focal sites on the overall Impofu Wind Farms plus Martial Eagle nest and Kouga Denham's Bustard lek should be monitored. If any sensitive species are found breeding on site in future these nest sites should be defined as focal sites. At Impofu East Focal Sites FS6, FS7, FS8, FS9 and FS10 should be monitored, plus any new ones identified.
- » All other incidental sightings of priority species (and particularly those suggestive of breeding or important feeding or roosting sites or flight paths) within the broader study area should be carefully plotted and documented.
- » The 11 Vantage Points already established on the overall site should be used to continue data collection post construction. The exact positioning of these may need to be refined based on the presence of new turbines and roads. A total of 12 hours of observation should be conducted at each vantage point on each site visit, resulting in a total of 48 hours direct observation on site per site visit. At Impofu East, three Vantage Points should be monitored.
- » The activities at the control site should be continued, i.e. 2 Vantage Points, 3 Walked Transects, 2 Vehicle Based transects, and 4 Focal Sites.
- » Given the proximity of the proposed wind farm to a Martial Eagle nest and possible implications for this pair of birds and their offspring during the lifespan of the wind farm, there will be a need for more detailed research and monitoring of these birds, possibly including eagle tracking studies using satellite or GPS telemetry.

### **Bird Fatality estimates**

This is now an accepted component of the post construction monitoring program and the newest guidelines (Jenkins *et al*, 2015) will be used to design the monitoring program. It is important that in addition to searching for carcasses under turbines, an estimate of the detection (the success rate that monitors achieve in finding carcasses) and scavenging rates (the rate at which carcasses are removed and hence not available for detection) is also obtained (Jenkins *et al*, 2015). Both of these aspects can be measured using a sample of carcasses of birds placed out in the field randomly. The rate at which these carcasses are detected and the rate at which they decay or are removed by scavengers should also be measured.

Fatality searches should be conducted as follows:

- » The area surrounding the base of turbines should be searched (up to a radius equal to 75% of the maximum height of turbine) for collision victims.
- » All turbines on Impofu East should be searched at least once a week (Monday to Friday).
- » Any suspected collision casualty should be comprehensively documented (for more detail see Jenkins *et al*, 2015).
- » A team of carcass searchers will need to be employed and these carcass searchers will work on site every day searching the turbines for mortalities.
- » It is also important that associated infrastructure such as power lines and wind masts be searched for collision victims according to similar methods.
- » Turbines 21, 23, 25, 28, and 29 are to be prioritised and must be searched fully every single week .

The most up to date version of the best practice guidelines (Jenkins *et al*, 2015) should inform the programme design at the time.



**Mitigation action plan to minimise bat mortalities during the operational phase**

- For the proposed Impofu East Wind Farm, Eastern Cape

**PREPARED FOR:**

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## 1 INTRODUCTION

This mitigation action plan must be implemented immediately once the operational bat monitoring study detects bat mortalities that are above the sustainable threshold for the wind farm. This threshold will be determined by the appointed Bat Specialist conducting the operational monitoring study and are based on the SABAAP Bat Threshold Document (MacEwan, *et al.*, October 2018). Although a different version of this document or another similar document may be adopted during the operation of the wind farm.

The Bat Specialist conducting the operational bat monitoring may overwrite this mitigation plan, but only when more applicable bat activity and climate data are available for specific problematic turbines or areas of the site.

The levels of and specifics of mitigation may need to be adjusted according to the results of the operational monitoring, based on robust scientific data. This is an adaptive management approach, and it is crucial that any changes suggested by the appointed Bat Specialist to this initial proposed mitigation schedule, be implemented as soon as practically possible.

## 2 GLOSSARY

The following terminology in relation to mitigations applies:

### **Curtailment:**

Curtailment is defined as the act of limiting the supply of electricity to the grid during conditions when it would normally be supplied. This is usually accomplished by locking or feathering the turbine blades, with the aim to raise the cut-in speed without free-wheeling.

### **Cut-in speed:**

The cut-in speed is the wind speed at which the generator is connected to the grid and producing electricity. For some turbines, their blades will spin at full or partial Revolutions per Minute (RPMs) below cut-in speed when no electricity is being produced.

### **Feathering or Feathered:**

Feathering refers to adjusting the angle of the rotor blade parallel to the wind, or turning the whole unit out of the wind, to slow or stop blade rotation. Normally operating turbine blades are angled almost perpendicular to the wind at all times.

**Free-wheeling:**

Free-wheeling occurs when the blades are allowed to rotate below the cut-in speed or even when fully feathered and parallel to the wind. In contrast, blades can be “locked” and cannot rotate, which is a mandatory situation when turbines are being accessed by operations personnel.

**Acoustic deterrents:**

This is a developing technology that are being experimented with on a nearby wind farm and thus far yielded positive results that may indicate potential effectiveness of the devices. However, data on the trail are currently available for only 4.5 months, which is a small sample set and many factors may influence effectiveness of the devices. It is encouraged for the wind farm operator to run experimental trails to test such similar devices during the operation of the facility.

**Increasing cut-in speed:**

The turbine’s computer system (referred to as the Supervisory Control and Data Acquisitions or SCADA system) is programmed to a cut-in speed higher than the manufacturer’s set speed, and turbines are programmed to be feathered at 90° until the increased cut-in speed is reached over some average number of minutes (usually 5 – 10 min), thus triggering the turbine blades to pitch back “into the wind” and begin to spin normally and produce power.

Blade locking or feathering that renders blades motionless below the manufacturers cut-in speed, and don’t allow free rotation without the gearbox engaged, is more desirable for the conservation of bats than allowing free rotation below the manufacturer’s cut-in speed. This is because bats can still collide with rotating blades even when no electricity is being produced. Currently the most effective method of mitigation is alteration of blade speeds under environmental conditions favourable to bats.

### 3 MITIGATION ACTION PLAN

1. Curtailment must be applied initially to all turbines at the start of operation by ninety-degree feathering of blades below the manufacturer’s cut-in speed, so it is exactly parallel to the wind direction and minimises free-wheeling blade rotation as much as possible without locking the blades. Influence on productivity is minimal since no power is generated below the manufacture’s cut-in speed. This is assuming it is technically feasible to do this with the turbines that are used for this wind farm.
2. Additional mitigation (**Table 2.1**) must be applied to any turbines or group of turbines identified as causing the wind farm’s mortalities to be above the sustainable threshold levels.

The table below infers that mitigation be applied when the advised wind speed and temperature ranges are prevailing *simultaneously* (considering conditions in which 80% of bat activity at 97m occurred). Wind speed measured at a height of 62m and temperature measured at a height of 60m were used for the analysis.

**Table 2.1:** Preliminary mitigation schedule to be implemented when above threshold mortalities are detected.

Preliminary mitigation schedule	
Peak activity (times to implement curtailment/ mitigation)	1 February – 30 April from the time of sunset to 23:00
Environmental conditions in which to implement curtailment/ mitigation	Wind speed below 4m/s <i>and</i> Temperature above 17°C
Peak activity (times to implement curtailment/ mitigation)	1 – 30 September from the time of sunset – 02:00
Environmental conditions in which to implement curtailment/ mitigation	Wind speed below 7.5m/s <i>and</i> Temperature above 13°C

3. The Bat Specialist conducting the operational bat monitoring may overwrite the schedule in **Table 2.1**, but only when more applicable bat activity and climate data are available for specific problematic turbines or areas of the site. The levels of and specifics of mitigation may need to be adjusted according to the results of the operational monitoring, based on robust scientific data. This is an adaptive management approach, and it is crucial that any changes suggested by the appointed Bat Specialist to this initial proposed mitigation schedule, be implemented as soon as practically possible

# IMPOFU EAST WIND FARM - REHABILITATION AND REVEGETATION PLAN



PRODUCED FOR RED CAP IMPOFU EAST (PTY) LTD

BY



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APRIL 2019

## Background & Purpose

The purpose of the Impofu East Wind Farm revegetation and rehabilitation plan is to ensure that areas cleared or impacted during construction activities of the proposed facility are rehabilitated with a plant cover that reduces the risk of erosion from these areas as well as restores ecological function to these areas as far as possible. The intention of the plan is not to provide a fully operational plan with detailed method statements and approaches, but rather to outline the principles that should underpin the operational implementation plan with rehabilitation actions that the appointed contractor would apply at the site during and immediately after construction.

## Rehabilitation Goals

It is important to define a rehabilitation benchmark and end-goal against which relative rehabilitation success at a site can be measured. The Society for Ecological Restoration (2002) provides eight objectives for a restored ecosystem:

- It should contain characteristic species that occur in the reference system;
- It should comprise largely of indigenous species;
- The functional groups necessary for continued stability must be present or have the potential to colonise;
- The physical environment must be conducive for the establishment of species that will lead to stability;
- It functions normally for its stage of development;
- It is integrated into a larger ecological matrix;
- Potential threats to the system's stability are eliminated;
- It is self-sustaining to the same degree as the reference system.

The above goals are fairly broad and the discussion that follows will provide details on how these goals can be achieved and what indicators can be used to measure progress towards these goals.

## Rehabilitation Targets

Although the overall goal of rehabilitation is provided above, it is common practice to set measurable targets against which progress can be measured and evaluated. Parameters that are usually measured include indicators of plant community structure and composition such as similarity to a reference area, species richness, species diversity, vegetation cover, species dominance, vertical structure and functional diversity of the vegetation. Important considerations with regards to setting such targets include ensuring that they are achievable, and secondly, that they change appropriately over time. In other words, there should be different targets for a parameter based on the time since rehabilitation. Targets for vegetation cover should be set as follows in reference to the baseline cover of the undisturbed vegetation:

- Year 1: 20%
- Year 2: 40%
- Year 3: 60%



Assuming that the background vegetation cover is 60% as typically occurs in the study area, the actual plant cover that would represent the above targets are as follows:

- 12% Cover
- 24% Cover
- 36% Cover

These targets must be closely tied into the monitoring schedule to provide references against which the effectiveness of monitoring can be measured. The ultimate goal should be to achieve approximately 80% of the background perennial plant cover.

Much has been made of species richness targets for rehabilitation. However, in most situations, these are not directly relevant as the emphasis should be on restoring ecological function. It is not practical or cost effective to attempt to restore high levels of plant biodiversity within a short time frame. Once some ecological function is restored, species richness will slowly increase and ultimately the effectiveness of rehabilitation in restoring species richness can only be evaluated after 10 or more years after rehabilitation. However, it is important to note that rehabilitation with a variety of species provides increased resilience to drought and other pressures. As a result, rehabilitation with single-species stands is not recommended and at least 3-4 species should be used in any area.

## **Plant Species Suitable for Rehabilitation at Impofu**

No alien species should be used for rehabilitation within areas of natural vegetation. Although some of these are easy to establish, in the long-run, they retard the return of the indigenous species and do not contribute to meeting rehabilitation goals. Although the species selected for use in rehabilitation should come from the local indigenous species pool, not all species are equally suitable for use in rehabilitation. The primary criteria for selection are practical and economic which usually dictate the ease with which species can be established. This includes survival rates, with establishment success being measured in the field at least a year after planting, once plants can be considered established and self-sustaining. Although there are not large numbers of species which are suitable for rehabilitation, it is important to select a mix of functional types or growth forms (i.e. a mix of grasses, low shrubs and tall shrubs) as this adds structural diversity to the rehabilitated areas and also increases resilience. Within the context of the Impofu site, the selection of species is complicated by the variety of vegetation types present and the large differences in composition that occur between these types.

In terms of which species are considered suitable for use in rehabilitation and revegetation at the site, it is useful to consider what attributes such species should or should not have. For example, species which grow tall or which might quickly generate a high fire danger are considered unsuitable for use near infrastructure due to the risks and management problems they may cause. In addition, annual species which flourish only after rains are also considered unsuitable as these would be absent in dry periods, leaving the soil exposed and vulnerable to erosion. The following general criteria have been identified as being important or useful in the selection of species for use in revegetation and rehabilitation. Some of these are considered essential criteria and others are considered desirable.

### Essential Criteria:

- **Only perennial species should be used.** Short-lived species may flourish after rains but die out shortly thereafter. In addition, such species may function to keep more desirable perennial species out through depressing their growth and establishment.
- **Only naturally occurring species are considered.** Species which do not naturally occur in the area are not considered viable options for use at the site.
- **No toxic or weedy species to be used.** Any species which are considered toxic to animals or people are not suitable candidates for use.

### Desirable Criteria:

- **Commercial availability of seed.** Ideally a species should have seed commercially available so that large quantities of seed can be purchased and used to establish the species across the site.
- **Ease of propagation.** For species that cannot be easily propagated from seed or for which seed is not commercially available, it is important that these species can be easily propagated vegetatively or by other means using standard nursery propagation techniques.
- **Ease of establishment.** Species used should be relatively easy to establish on-site, preferably using methods that be used across a broad area, such as standard agricultural planters or seed spreaders.
- **Ease of management.** Species used should be relatively easy to manage and should not pose a risk of become a problem at the site through establishing dense thickets, producing excessive biomass or otherwise hindering the daily operation of the plant.

## **Suitable Plant Species**

A variety of species are identified below as potential candidates for use in rehabilitation and revegetation at the site. It is important to note that in practice several of these species should be used in conjunction to increase establishment success and account for differences in establishment between species that are likely to occur on different soil substrates and moisture conditions. In addition, there are likely to be different requirements and management objectives for different parts of the site. For example, in some areas the vegetation may need to be kept and controlled at a shorter level than other areas where taller vegetation may be acceptable. There are also likely to be places where it is desirable to establish taller woody species for landscaping, visual mitigation or other purpose. As such, a variety of species have been recommended, ranging from prostrate-growing grasses to large trees, which can all be used depending on the specific area and required purpose. For each species identified, some background on the species is provided as well as possible uses and advantages and disadvantages of each species. For ease of interpretation, these have been categorised into the following growth forms: Grasses, Shrubs and Trees.

**Table 1.** Table of species identified as being indigenous to the site and considered suitable for rehabilitation and revegetation purposes.

Shrubs:	Grasses:	Trees:
<p><b>Dune Fynbos</b></p> <ul style="list-style-type: none"> <li>• <i>Leucospermum cuneiforme</i></li> <li>• <i>Leucodendron salignum</i></li> <li>• <i>Metalasia densa</i></li> <li>• <i>Anthospermum spathulatum</i></li> <li>• <i>Passerina corymbosa</i></li> <li>• <i>Searsia crenata</i></li> </ul> <p><b>Sandstone Fynbos</b></p> <ul style="list-style-type: none"> <li>• <i>Leucodendron conicum and other locally occurring Leucodendron spp.</i></li> <li>• <i>Passerina corymbosa</i></li> <li>• <i>Protea nerifolia and other locally occurring Protea spp.</i></li> <li>• <i>Erica discolor</i></li> <li>• <i>Ursinia scariosa</i></li> <li>• <i>Agathosma ovata</i></li> </ul>	<p><b>Dune Fynbos</b></p> <ul style="list-style-type: none"> <li>• <i>Ischyrolepis eleocharis</i></li> <li>• <i>Finicia dunensis</i></li> <li>• <i>Ehrharta calycina</i></li> <li>• <i>Eragrostis capensis</i></li> <li>• <i>Eragrostis curvula</i></li> <li>• <i>Themeda triandra</i></li> <li>• <i>Digitaria eriantha</i></li> </ul> <p><b>Sandstone Fynbos</b></p> <ul style="list-style-type: none"> <li>• <i>Restio triticeus</i></li> <li>• <i>Tetraria capillacea</i></li> <li>• <i>Diheteropogon filifolius</i></li> <li>• <i>Heteropogon contortus</i></li> <li>• <i>Themeda triandra</i></li> <li>• <i>Tristachya leucothrix.</i></li> </ul>	<p><b>Dune Fynbos</b></p> <ul style="list-style-type: none"> <li>• <i>Olea exasperata</i></li> <li>• <i>Pterocelastrus tricuspidatus</i></li> <li>• <i>Searsia lucida</i></li> <li>• <i>Sideroxylon inerme</i></li> <li>• <i>Tarchonanthus littoralis</i></li> </ul>

## Monitoring and Evaluation

The primary purpose of monitoring should be to inform and enable adaptive management interventions and improve rehabilitation outcomes. As such, monitoring must be linked to targets, their associated measurement intervals as well as what actions are triggered when a target has not been met. There should thus be a clearly defined feedback between monitoring outcomes and consequent rehabilitation actions. A critical component of monitoring is detailed record keeping and associated data management.

There are various approaches to monitoring and parameters that can be measured. It is however important that these are relevant and practical to measure. Simple indicators such as plant cover and species richness are usually the most simple and reliable to measure, with a variety of published and well-known sampling methods.

As rehabilitation success is unpredictable in arid environments, monitoring and follow-up actions are important to achieve the desired cover and soil protection. The following basic monitoring schedule with associated remedial actions is recommended:

- Re-vegetated areas should be monitored every 6 months for the first 18 months following construction. Thereafter, monitoring should be conducted annually until such time as the target areas have attained the desired benchmark vegetation cover.

- Re-vegetated areas showing inadequate surface coverage (less than 20% within 12 months after re-vegetation) should be prepared and re-vegetated;
- Any areas showing erosion, should be re-contoured and seeded with indigenous shrubs or succulents present in the local area.

## **Conclusions & Recommendations**

When selecting species for revegetation and rehabilitation it is important to select species that are readily available or which can be readily propagated for this purpose. In addition, the primary determinant of revegetation success is survival of plants early on after germination or establishment. As such it is essential to select species which have a high probability of survival and which are naturally adapted to the conditions of the area. Timing is also likely to be important as rehabilitation during or immediately prior to the dry season is likely to result in significantly less success than rehabilitation early on during the wet season. The sandy soils of the site are generally poorly developed sandy soils with the result that soil limitations on rehabilitation success are likely to be relatively low and natural regeneration of vegetation on cleared areas is likely to be relatively rapid. As in most environments, the natural regeneration of vegetation can be significantly enhanced and reduce the need for active rehabilitation if effective topsoil management is implemented during the construction phase of the project. However, especially within the areas of dune fynbos, alien invasion is likely to be a problem within the cleared areas and as such, the rehabilitation plan needs to be closely allied and aligned with the alien management plan.

It is important to note that there is no single choice of plant species which can meet all rehabilitation and revegetation requirements. A mix of species provides for greater resilience in the face of an unpredictable environment where rainfall and climate vary substantially and affect different species in a different manner. In general 3-4 species should be used in any areas requiring rehabilitation and preferably, these should include a variety of growth forms such that greater vegetation structural diversity is achieved. Finally, it is important that monitoring be used firstly to check progress towards the identified rehabilitation targets and secondly be used to inform and trigger actions that may need to be implemented where these targets are not being met.

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# IMPOFU EAST WIND FARM – OPEN SPACE MANAGEMENT PLAN



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## ***OPEN SPACE MANAGEMENT PLAN - PURPOSE***

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The purpose of the Impofu East Wind Farm Open Space Management Plan is to provide a framework for the integrated management of the natural and semi-natural areas within and adjacent to the Impofu East Wind Farm during the daily operational activities of the wind farm. The footprint of the facility will occupy a small proportion of the site, but impacts resulting from the construction and operational activities of the facility may extend beyond the required footprint and impact biodiversity within the site more generally. The goal of the Open Space Management Plan is to reduce the ecological footprint of the Impofu East Wind Energy Facility through ensuring that the facility operates in a biodiversity-compatible manner and does not have a long-term negative impact on the local environment.

## ***PROBLEM OUTLINE***

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The Impofu East Wind Farm is located within a matrix of transformed as well as natural vegetation with a variety of free-roaming wildlife as well as livestock. In addition, alien plant invasion, soil erosion, motor vehicle impacts, noise and disturbance generated by operational activities and human disturbance are potential impacts that may occur on an on-going basis at the site and extend beyond the actual footprint of the development. The purpose of the plan is therefore to ensure that the facility operates in a biodiversity compatible manner and does not have a long-term negative impact on the local environment.

## ***RELATION TO OTHER SUBPLANS***

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During construction, there are a variety of subplans developed as part of the EMPr for the development that are aimed at ensuring that construction occurs in a responsible and biodiversity-compatible manner. This includes the Plant Rescue and Protection Plan, Revegetation and Rehabilitation Plan and Alien Management Plan. The purpose of the Open Space Management Plan is to ensure that all the different plans are aligned, and that additional measures are implemented during the operation of the facility to ensure that negative environmental impacts of the development are minimised.

## ***OPEN SPACE MANAGEMENT SUBPLAN***

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The following elements are considered part of the Open Space Management Subplan

### ***Access Control:***

- Access to the facility should be strictly controlled.

- All visitors and contractors should be required to sign-in.
- Signage at the entrance should indicate that disturbance to fauna and flora is strictly prohibited.
- If there are fenced-off parts of the facility such as substations, O&M buildings etc., these should be fenced with a single fence with electrified strands only on the inside of the fence and not the outside, if required at all.

### Prohibited Activities:

The following activities should not be permitted within the facility by anyone except as part of the other management programmes of EMP for the development.

- No fires within the site.
- No hunting, collecting or disturbance of fauna and flora, except where required for the safe operation of the facility and only by the Environmental Officer on duty and with the appropriate permits and landowner permission.
- No driving off of demarcated roads.
- No interfering with wildlife or livestock.

### Fire Risk Management:

Fires are a natural occurrence in the vicinity of the site, and cannot be avoided in the long-term. Retarding the natural spread of fires, can result in the build-up of biomass and ultimately more intense and uncontrollable fires. However, at the same time, fires above the natural background frequency can have negative consequences for biodiversity and can result in the elimination of certain sensitive species from the area.

The National Veld and Forest Fires Act places responsibility on the landowner to ensure that the appropriate equipment as well as trained personnel are available to combat fires. Therefore, the management of the facility should ensure that they have suitable equipment as well as trained personnel available to assist in the event of fire. It is likely that there is also a Fire Protection Association active in the area and the wind farm should engage with the association to ensure that it can provide appropriate support to the association in the event of wildfires. In general, wind farms represent a potentially positive development in relation to wildfires as the associated access roads can act as firebreaks as well provide access routes for active fire-fighting.

### *Firebreaks*

Firebreaks around certain infrastructure components such as substations may be necessary to prevent damage if these occur in fire-prone areas. The local Fire Protection Association should be engaged with regards to the appropriate fire break widths and treatments.



### Alien Plant Control

- Alien invasive plants should be controlled according to the Alien Invasive Management Plan.
- No non-locally occurring or alien plants should be established or brought onto the site.

### Erosion Management

- The facility should be inspected every 6 months for erosion problems or more frequently in the event of exceptional rainfall events. All erosion problems should be rectified according to the Erosion Management Subplan.

### Faunal Management

The site will remain a semi-natural environment with a full complement of resident natural fauna, including a variety of mammals, reptiles and frogs that may be impacted by day to day activities at the site. The management of the facility should be aimed at trying to minimise interactions between wildlife and the facility in terms of its staff, infrastructure and activities.

- Bird monitoring and mitigation should occur according to the Avifauna Monitoring Programme.
- Snakes & Reptiles
  - There are likely to be a variety of snakes present at the site including venomous species such as Puff Adder and Cape Cobra. They may be attracted to certain features such as buildings if these provide shelter or contain an abundance of prey species such as rodents.
  - Snakes encountered within the facility may pose a danger to staff and should be allowed to move off on their own in the case of snakes encountered on roads or other areas within the 'veld' or be removed unharmed to safety by a suitably qualified person in the case where these pose a danger to humans.
  - All vehicles should give way to snakes and tortoises crossing roads. There are a lot of access roads at the site and reptiles will be crossing these on a regular basis and the potential for mortality resulting from being 'run over' is high. All vehicles should adhere to a low speed limit (<40km/h) and give way to all reptiles crossing the roads.
- Mammals
  - Resident fauna should not be habituated by feeding them scraps or other foodstuffs and it is not necessary to provide such species with water either as most arid fauna are independent of water. As such, it is also important that all waste at the site is handled appropriately and kept in closed bins not accessible to fauna.

- Some species are vulnerable to being hit by motor vehicles including Steenbok, Bat-eared Fox and Hares. All vehicles on the site should adhere to a low speed limit (<40km/h) and give way to any mammals on the roads, especially if there is any driving on the site at night.
- All incidents should be recorded on a log maintained by the Environmental Officer, so that additional mitigation measures can be implemented if there are any specific areas where regular incidents occur.
- If there is any post-construction trenching or similar activity at the site, any trenches and holes excavated should not be left open for extended periods as fauna can fall in and become trapped. Trenches should have ramps of soil present where fauna can escape or should be excavated incrementally so that they are used only as required and do not stand open for extended periods.
- General Faunal Mitigation
  - Night-lighting at the site should be kept to a minimum. Artificial lights affect invertebrates and migrating birds and also attract bats and birds. If any parts of the site need to be lit at night for security or other reasons, then all lighting should be downward-directed low-UV type lights (such as most LEDs), which do not attract insects.
  - Any chemical, fuel, oil or other spills should be cleaned in the appropriate manner as related to the nature and extent of the spill. Contaminated soil should be removed from the site.

### Integrated & Adaptive Management

The management of the facility should meet with the landowner and other relevant local managers to review the management of the facility on a regular basis. Records of such meetings should be maintained including decisions and management outcomes resulting from such meetings. The Open Space Management plan should be reviewed annually for the first three years post-construction to evaluate the effectiveness of management actions so that these can be adapted as appropriate.

### Monitoring & Evaluation

- As the integrating framework for the environmental management of the site, the Open Space Management Plan should ensure that all monitoring and associated record keeping is conducted according to the schedules of the respective subplans.
  - As the issues at the site are likely to change over time, the Open Space Management Plan should be evaluated on an annual basis for the first three years of operation and then every 3 years or more regularly if required. Where specific problems

arise, persons with relevant expertise should be brought in to advise the management of the site and update the Open Space Management Plan.

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**PROJECT TRAFFIC MANAGEMENT PLAN  
FOR  
IMPOFU EAST WIND  
FARM**



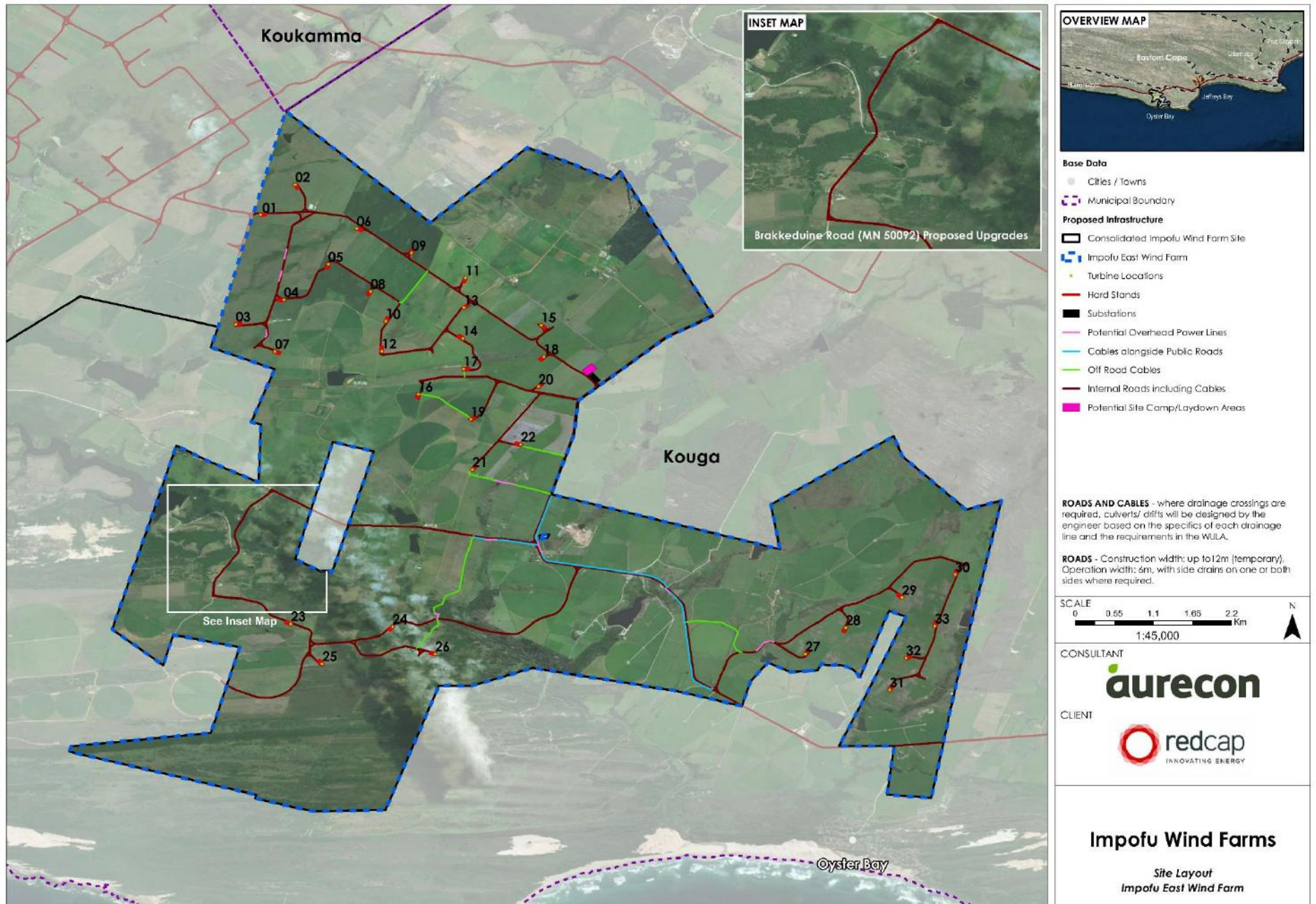
## **1.0 INTRODUCTION**

This document has been developed in order to identify high-risk areas relating to pedestrian, animal and vehicle movements both internal and external to the Impofu East construction site and to mitigate the risks involved.

As with any document relating to construction site safety - the Traffic Management Plan must be continually monitored and updated as the site construction develops and conditions on site change.

Once the initial plan has been developed and put in place a site diagram / map should be made available to all site personnel and used as a means of passing on site information during site inductions. Any major updates or alterations to the plan will be conveyed to site personnel via a toolbox talk or instructions from their supervisors.

## 2.0 SITE LAYOUT



Main site camp layout (This will be inserted as per the design supplied by the main contractor prior to construction)



### **3.1 SUMMARY OF SITE RULES**

1. Normal site working hours is 07:00-19:00 Monday to Friday and 07:00-13:00 on Saturdays.
2. The minimum Personal Protective Equipment requirements for individuals on the project site are; Safety boots, long pants and shirt, hi-viz reflective vest, hard hat and certified safety glasses.
3. Every person entering site need to report to the site offices for Site Induction and training
4. Site visitors must be accompanied by an inducted employee at all times.
5. Maximum project speed limit is 30km/hr.
6. Report all H&S and Environmental near-miss, hazardous conditions and accident / incidents to site management immediately.
7. All climbing and lifting equipment must be checked daily before use.
8. Report, replace, and / or repair defective equipment before use.
9. All vehicles must drive with a rotating flashing light on the roof and their headlights on.
10. Seat belts must be worn in vehicles and equipment while moving.
11. No riding on / in equipment / vehicles unless there is a seat and seatbelt for you. I.e. No transport in the back of bakkies allowed (even to/from site).
12. No smoking on site unless in designated areas.
13. No Drugs, Alcohol, or Weapons allowed on site.
14. Obey all warning signs, traffic signals and/or flag persons. Stay alert to potential hazards.
15. Only certified or qualified personnel shall operate tools / plant and equipment.
16. Traffic control measures must be used when working on or adjacent to the site roads especially when offloading material, using cranes, excavators, digging trenches or blocking part of the road for any reason.
17. NO climbing turbines, masts, ladders, or scaffolds unless authorized to do so and wearing proper PPE.
18. Never put any part of your body under a suspended load.
19. Check load ratings and rigging gear daily.
20. Be vigilant of poisonous snakes, spiders and plant life.
21. Mind your trash and only dispose in designated bins.
22. Communicate and cooperate with other workers / companies.
23. No horseplay, running, or jumping at anytime.
24. Be kind to landowners and 3<sup>rd</sup> parties, and do not interfere with any farm, wildlife or domestic animals.
25. Do not remove or damage any plants, trees or flowers.
26. Do not drink any water not marked as "DRINKING WATER"

#### **4.1 SITE TERRAIN**

- The Road infrastructure from the N2 & R102 is mainly gravel and contractors and visitors should make themselves familiar with driving on gravel roads and keep to a safe traveling speed and 4x4 vehicles are recommended to reach and drive around site.
- The terrain on site can present significant hazards and risks, and drivers/operators of all vehicles/plant should be well aware of the conditions when operating vehicles on site.
- Gravel and sand roads have very little traction during sharp turning or sudden braking; do not exceed the 30 km/h speed limit.
- Soft sandy road verges present that can cause vehicles to get stuck or overturn
- Significant section of the site is on loose sand and all drivers are advised not to enter into soft sandy areas and to stay on the gravel roads
- Excessive speed and dust will cause bad visibility, all vehicles to ensure headlights and beacon lights are on at all times.
- During wet periods the road surfaces turn very slippery and muddy. Reduce speed and do not accelerate or break suddenly.
- High fill areas with road narrowing's with steep embankments and soft verges will be one way traffic "stop and go controlled".
- No parking on roads causing obstruction is allowed.
- No driving or parking on topsoil is allowed.
- All gates marked with red tags must be kept closed at all times.
- Only drive to and from your area of business. No driving in unauthorised areas.
- Beware of wild and farm animals on or crossing the roads.

#### **5.1 ENTERING SITE**

- All main access points to the site will be controlled by a boom gate guarded 24/7.
- Every person entering site need to report to the site offices for a Site Induction and training on the relevant Risk Assessment and Method Statements for the task they will fulfill.
- All once off/short stay visitors and delivery drivers will be provided and sign for an abridged version of this traffic management plan and must be accompanied by an inducted employee at all times.
- All persons will sign in and out on the access control document every time they move through the gate.
- Only authorised vehicles will be allowed onto site and breach of this rule will result in the vehicle and driver to be removed off site immediately. To obtain authorisation; each vehicle entering site need to be checked by the appointed GMR 2(1) Machinery Supervisor of each contractor. The completed vehicle inspection form shall then be submitted to the H&S Officer, who will issue an "Authorised Site Vehicle" sticker that need to be displayed in the windscreen (See Appendix A).
- In the event of a once off delivery and/or visitor, the security guards will undertake a brief visual inspection of the vehicle and issue a "Temporary Vehicle Access Permit". This will need to be displayed in the windscreen and must be returned to the security when the vehicle exits site.
- It is the responsibility of the driver to ensure their vehicle is roadworthy and safe to drive, all defects must be declared to security when entering site and no vehicle with a serious defect will be allowed on site. In the event of dispute if a vehicle is safe or not, the H&S Officer or Site Manager will make the final decision.

- When entering site, all driver/operators/persons will be tested for alcohol with a breathalyser. In the event of failing the breathalyser, the person and vehicle will not be allowed onto site.
- Visitors will only be allowed to drive to the site compound, but when entering site, all vehicles must have an amber beacon light on the roof.
- Vehicles will be searched randomly when entering/exiting site and only authorized personnel will be allowed to remove any equipment, tools or material off site.

## **6.1 PPE**

- Safety boots, long pants and shirt, hi-viz reflective vest, hard hat and certified safety glasses is an integral control measure within the existing traffic management risk assessment and is therefore mandatory on site at all times including visitors. (All shall be worn when outside the vehicle).

## **7.1 COMPOUND AREAS**

- The main site compound area is fenced off with permanent staff and some visitor parking spaces. No minibuses or vehicles other than for managerial staff are allowed within the compound.
- Only reverse parking is allowed
- The confines of the site compound (within fenced area) is deemed a safe area where the minimum PPE requirements is relaxed but still applicable as principle. Once a person exits the confines of the compound for any reason, the minimum PPE requirements becomes compulsory.
- The main plant yards, storage and laydown areas are deemed “on site” and all site rules incl. PPE requirements will apply. There is no designated walkways in these areas as plant and storage requirements change on a daily basis. All pedestrians should thus be vigilant and assess the plant and material movements in the yard before accessing.

## **8.1 MATERIAL DELIVERY / STORAGE AREA**

- Statutory agreements is required for all deliveries contractors, irrespective if it is a once of delivery. These include the OSHAct 37.2 agreement, Letter of Good Standing and CR 7(1)(c)(v). These documents either need to be provided in advance to H&S Officer or on the day of the delivery. Failure to provide these records will result in no access being given.
- All deliveries are to be restricted to the normal site working hours
- All deliveries to the site are to be pre-arranged and each contractor will be responsible to ensure that delivery drivers are issued with a transport plan and map to reach site.
- For once off deliveries, the security will issue each driver with a site layout map and instruction sheet to enable them to navigate the site safely.
- It is the responsibility of each contractor to inform and if required to escort visitors and/or delivery vehicles to the point of business/delivery.
- Plan deliveries in advance as delivery times of critical loads may have to be restricted around farming activities.
- Minor miscellaneous deliveries should not coincide with the delivery of main components to the site.
- A delivery waiting area has been established adjacent the Site Compound area.
- Materials are to be stacked and stored in a safe manner and only in designated areas.
- All working at height for offloading/loading of delivery wagons need to be in line with the fall protection plan of each contractor.

## **9.1 VEHICLES AND TRAFFIC MOVEMENT**

- It is the responsibility of each contractor to inform and if required to escort visitors and/or delivery vehicles to the point of business/delivery.
- Maximum project speed limit is 30km/hr. Compliance will be checked by speed gun and non-complying drivers will have their site access cards revoke and removed from site.
- Employees must be transported with vehicles designed for passenger transport. Nobody is allowed on the back of LDV's or trucks without adequate fall protection being in place.
- Never leave vehicle with motor running or with key in the ignition.
- Obey all traffic signs, flag people, stop go controls, speed limits
- All vehicles will be issued with an official sticker or sign identifying it as authorised to enter site.
- All vehicles / plant / being driven/operated on site are to have a daily checklist and an official sticker displayed on the front windscreen
- All Mobile cranes, crane trucks, Tele handlers etc must have current load test certificates, Inspections done by accredited inspection authority, rope test certificates etc.
- All persons operating vehicles / plant / lifting equipment must be in possession of their current Training Certificates / Drivers Licences.
- Flag persons must control plant movements and reversing of vehicles.
- When not in use all vehicles / plant / equipment is to be left parked in an allocated parking area with drip trays placed under the engine and keys removed.
- All plant / lifting equipment should be fitted with a orange beacon light.
- Large vehicles and construction plant are to be fitted with an audible reversing alarm.
- Height limit signs must be adhered to, goal posts will be installed where overhead service cables are present.
- All vehicles / plant in use on site are to be fitted with serviceable seatbelts which are to be worn by the driver / operator and passengers at all times during use.
- Where road conditions require a one-way traffic control systems will be in operation, the system will be clearly signposted and controlled by a flag person or stop go controls.
- Where a one-way traffic system cannot be operated, the laden and largest vehicle will have the right of way.
- Where conditions dictate that provision of a turning point is not practical then a Banksman must be used to assist vehicles / plant when reversing.
- The use of cell phones whilst operating a vehicle / plant / equipment is not allowed. Anything that distracts the driver / operator must be avoided.
- During works at an occupied site (local residents), all large or abnormal load vehicles / plant that are required to manoeuvre through residential areas are to have a Banksman.

## **10.0 PEDESTRIAN TRAFFIC.**

- If applicable, all pedestrian routes are to be clearly signed and adequately fenced off from main traffic and construction routes on site when practicable.
- During works at an occupied site (local residents and land owners), the public are to have right of way at all times unless traffic signs dictate otherwise. The public are to be informed of plant movements with the appropriate warning signs.
- If relevant - Where pedestrian routes cross vehicle / plant traffic routes these areas must be clearly marked on the ground and on the site map. The crossing points must provide maximum visibility to both pedestrians and vehicle/plant operators.

## **11.1 PARKING**

- Park any vehicle with consideration to safety to yourself and others.
- Only reverse parking is allowed on site.

- Parking is only to take place at authorised / designated parking areas or as indicated by signage or verbal instruction from the site supervisor.
- The driver needs to ensure their vehicle is safely parked with the park brake engaged and the wheels chocked.
- Car parks need to be separated from storage / loading areas in order to avoid unnecessary interface between delivery vehicles and other construction plant and likewise - construction traffic is separated from contractors / visitors parking areas.
- Do not at any time, obstruct any access roads, gates or construction areas as emergency vehicles and land owners need uninterrupted access to all parts of the site at all times.
- When construction plant is standing longer than a 2-hr period a drip tray need to be placed under the plant.

### **12.1 HIGH RISK / OUT OF BOUNDS AREAS.**

- Generally, the site roads are windy and narrow with soft sandy verges.
- A combination of guardrails and delineators will be installed to demarcate the road edges (See Appendix B).
- Where delineators are placed on the road edge, no overtaking or passing will be allowed
- A one-way traffic control system will thus be implemented in restricted and critical high traffic flow areas.
- In most cases, laden vehicles will have the right of way and smaller construction vehicles need to pull off the road or wait in a safe area for laden vehicles to pass.
- All drivers and site personnel will be advised of high-risk or restricted areas during the site induction process, by the use of road signs, barriers and during the daily task briefings.
- Consideration regarding environmental pollution (watercourses, noise, dust, and mud and slurry contamination) must be taken by each contractor and briefed to each driver.

### **13.1 OTHER**

- Roadworks are to be controlled via co-operation between the Project team and the contractor related to this works.
- When new information is known it will be attached to this plan and all site personnel informed via toolbox talk or instructions from supervisors.

## 14.0 APPENDICES

### Appendix A – Example of Construction Vehicle Checklist



#### CHECKLIST FOR CONSTRUCTION VEHICLES & MOBILE PLANT

*Including but not limited to:*

**BAKKIES, CARSE, MINI BUSES, DUMPER TRUCKS, TRUCKS, LIGHT DELIVERY VEHICLES, FRONT END LOADERS, PILING RIGS, TLB's, EXCAVATORS, MOBILE CRANE'S, BOB CATS and/or any other Construction Vehicles etc.**

PRINCIPLE CONTRACTOR: \_\_\_\_\_ INSPECTION DATE: \_\_\_\_\_

SUB - CONTRACTOR: \_\_\_\_\_ OPERATOR'S NAME: \_\_\_\_\_

VEHICLE DESCRIPTION / REG NR: \_\_\_\_\_

VALID ROADWORTHY DISC: \_\_\_\_\_ EXP DATE: \_\_\_\_\_

EQUIPMENT DESCRIPTION	IN ORDER		COMMENT
	YES	NO	
HEAD LIGHTS & FRONT INDICATORS			
BEACON LIGHT			
WINDSCREENS & WINDOWS CONDITION			
WINDSCREEN WIPERS			
HOOTER			
FIRE EXTINGUISHER WITH BRACKET			
SEAT BELT			
REAR VIEW MIRRORS (if Applicable)			
REAR INDICATORS & TAIL LIGHTS			
REVERSE ALARM			
TIRE CONDITION			
ROLLOVER PROTECTION			
PROTECTION FOR WORKING AT HEIGHT, EDGE PROTECTION			
ADEQUATE MACHINE GUARDING			
LOAD BIN      Flip Lid Hooks, Bolting, Drop nose pins			
ANTI TWO BLOCK SYSTEM			
LOAD LIMITER FITTED			
VALID LOAD TEST CERTIFICATE AND INSPECTION			
VALID LOAD TEST CERTIFICATE FOR LIFTING TACKLE			
BRAKE & HANDBRAKE TEST			
SIGNS OF EXCESSIVE GREASE			
HYDRAULIC CYLINDERS & HOSES FREE FROM ANY LEAKS			
YELLOW REFLECTIVE TAPE / CHEVRON			
NO PLAY IN STEERING COLUMN			
SAFE ACCESS ONTO AND FROM DRIVERS SEAT/CABIN			

INSPECTED BY: \_\_\_\_\_

SIGNATURE: \_\_\_\_\_

OPERATOR / DRIVER : \_\_\_\_\_

SIGNATURE: \_\_\_\_\_

GMR 2 APPOINTEE: \_\_\_\_\_

SIGNATURE: \_\_\_\_\_

**\* Please Note: DO NOT allow operator on site without proof of documentation**

**Appendix B – Guardrail and Delineator Layout Plan (Rev1)**





**IMPOFU EAST WIND FARM  
STORMWATER MANAGEMENT PLAN**

April 2019

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# STORMWATER MANAGEMENT PLAN

## 1. SCOPE

This report deals with the management and control of stormwater and soil erosion at the Impofu East Wind Farm site. This report must be updated with all relevant conditions related to Storm Water Management contained in the Environmental Authorisation (if authorised) and Water Use License (if authorised), as well as any site specific conditions that result from the micro-siting walk through with relevant specialists.

## 2. GENERAL SITE CONDITIONS

Rainfall for the site is given as 662 mm per annum (The World Bank Climate Change Knowledge Portal, undated) distributed quite evenly throughout the year, but slightly higher rainfall during the late winter and springtime (August to October) months. The micro-sited access roads and associated infrastructure as well as the hardstand areas will be overlaid on the topography for the site prior to the start of construction and will be detailed in Figure XXX in **Appendix C**.

The infrastructural footprint of the proposed wind farm is located on coastal plains at an altitude of between 180 and 250 metres. Slopes across the site are almost entirely less than 5% but may be greater in a few isolated spots (Lanz, 2019).

Due to the sandy nature of the soil as well as the steep topography in parts of the site, there is a risk of erosion although the probability is generally low as no actual streams or rivers with defined channels occur on site.

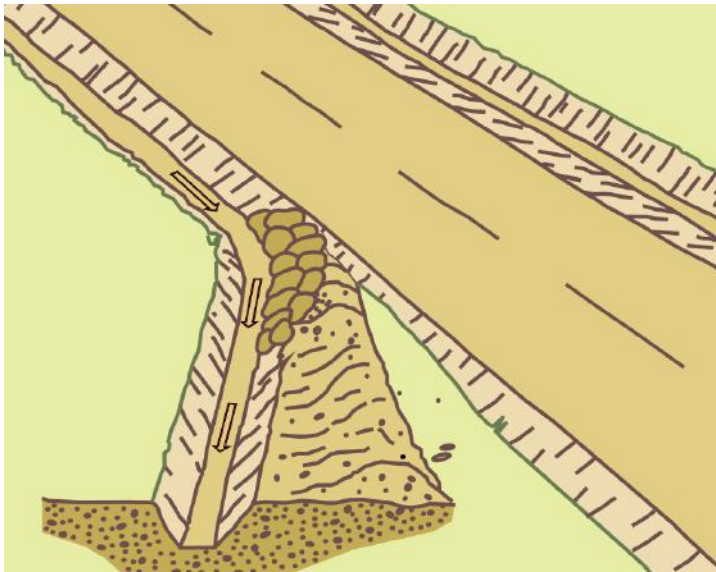
In areas of sensitive vegetation and wetlands, special care must be taken to minimize the impact of construction activities.

Due to the sandy soil conditions, a high rate of infiltration is expected which will result in low run-off volumes. The dense vegetation in some areas will also reduce the run-off.

## 3. ROAD CONSTRUCTION AND STORMWATER MANAGEMENT

The site access roads have been designed with a 6 m wide gravelled travelling surface and 2% crossfall across the width of the road. A 450 mm deep side drain is to be constructed on the lower side of the road where required. Mitre drains (or off-shoot drains) lead water from the side drains away to lower lying areas next to the road.

A Typical Mitre drain is shown in the figure below:



These types of drains must be provided at regular intervals along the roads to disperse accumulated water away from the road. Typical spacing of mitre drains is as per the table below:

Mitre Drain Intervals		
Road gradient (%)	Interval should not exceed (m)	When discharging the water into farmlands
12	40	20 to 50 metres, wherever possible into the boundaries between farmlands
10	80	
8	120	
6	160	
4	200	
1-2	50 if excessive silting may occur	

Steep topography in parts of the site and maximum road gradient specification of 8% above may require some deep cuts and high fills to ensure accessibility for the delivery vehicles to all turbine locations. Banks in cut and fill scenarios should have slopes of minimum 1:2 (V:H) to limit erosion and improve slope stability. In these areas special attention is required to minimize erosion. Storm water drains should be utilised along the tops of high fills to limit runoff down these slopes.

Straw stabilization is proposed for all the disturbed sandy construction areas. This limits wind and (to a limited extent) water erosion and promotes quick re-growth.

Stone pitching and gabions and further methods allowed for steep slopes and energy dissipation (where required) to assist in breaking the energy of the water and to limit erosion in the site.

Stormwater pipe crossings are to be installed at low points in the roads to accommodate runoff effectively in areas where construction will interfere with the natural watercourses. For any work on stream crossings in order to prevent excessive levels of silt and any potential contaminants entering the adjacent wetlands, headwalls and erosion protection should be provided. Please refer to the Roads and Excavation Method Statements in **Appendix D1 & D2** for specific detail.

A proposed typical cross section of the roads is attached as **Appendix A**.

#### **4. TURBINE PLATFORMS AND FOUNDATIONS**

Platforms are to be created at each turbine location to facilitate the erection of the turbines. These platforms will be approximately 50 m long and 30 m wide with a maximum slope of 1% in any direction. Turning shunts and laydown areas are also to be provided where required. The final levels of these platforms should be within 1,1 m of the top of the foundation pedestal level to ensure sufficient crane height during the turbine erection process. The platform areas and turning shunts are to be gravelled in a similar way to that of the roads. Side drains with mitre drains should be provided along the edges of these to deal with stormwater runoff in these areas. Erosion protection similar to what is required along the roads should also be provided as and where required. The drainage and erosion protection at these locations are site specific and should best be approved on site by the Engineer. Please refer to Roads, Excavation and Concrete & Blinding Method Statements in **Appendix D1, D2 & D3** for specific detail

A proposed general layout and cross section of the platforms is attached as **Appendix B**.

#### **5. GROUND AND SURFACE WATER CONTAMINATION PREVENTION**

Pollution of ground and/or surface water as a result of construction activities should be prevented.

Pollution could result from:

- Contaminated runoff from construction camps, released by accident or otherwise.
- Discharge of contaminated construction water, chemicals, oils, fuels, sewage, runoff from stockpiles, solid waste and general litter.
- Use of paint, cold galvanizing or washing of paint brushes

Runoff from the site camp should be accommodated overland and not be accumulated to promote appropriate infiltration into the soil. All polluted runoff should be contained and treated by providing designated and properly designed and constructed washing areas for all equipment.

This water should be collected to a specific point and treated as hazardous waste. This should not take place in close proximity to any natural watercourses or sensitive areas.

For work on any stream crossings, bidim geotextile will be utilised on either side of the crossing during construction to prevent excessive levels of silt and any potential contaminants entering the adjacent wetland. Please refer to the Roads Method Statement in **Appendix D1** for specific detail.

Ablution facilities should be properly maintained and managed as per the requirements of the Environmental Management Programme (EMPr) and WUL (if authorised).

#### **6. GENERAL EROSION CONTROL**

All areas where erosion can occur should be provided with proper erosion protection and/or stabilization methods. Rip-rap, straw stabilization, gabions and stone pitching should be provided where deemed necessary. Frequent monitoring and repairing of erosion prone areas should be undertaken during and after construction.

Topsoil stockpiles should conform to the required height and slope restrictions to reduce the risk of erosion in these areas, as detailed in the EMPr

Preventative measures should be taken to ensure that no material is washed into and/or deposited in watercourses and/or sensitive areas. Mitre drains should be kept clean and free of any solid waste or debris.

## **7. TRAINING**

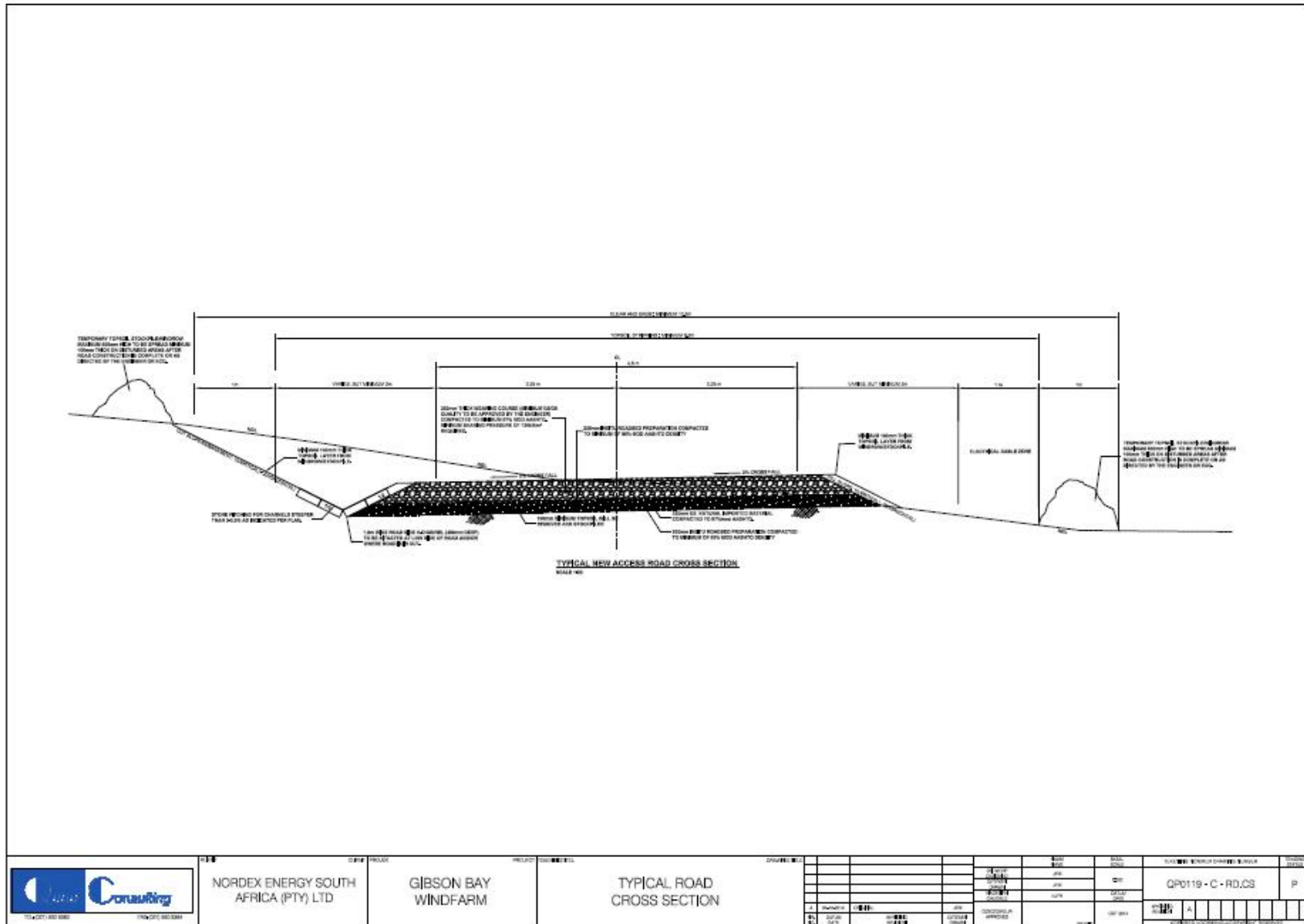
As part of their induction training, all workers on site should be made aware of the importance of stormwater management and the minimization of erosion. This should form part of the environmental awareness training and be included in the induction training material distributed to them.

## **8. MONITORING AND REPORTING**

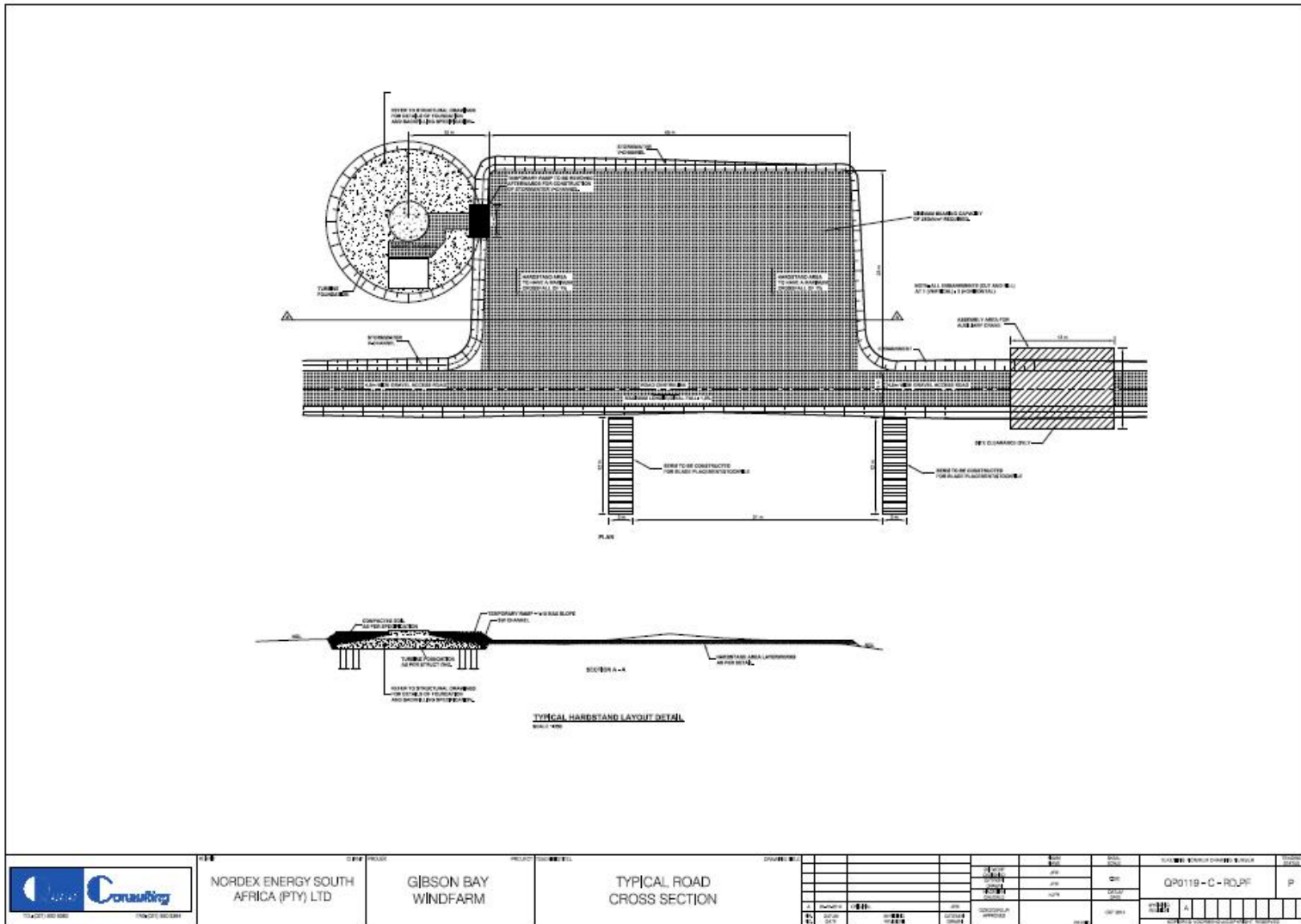
The Environmental Control Officer should monitor the implementation of the stormwater management plan on a daily basis. This includes all stormwater management features such as mitre drains, discharge areas, pipe culverts, water crossing and all erosion protection measures. This should be audited during routine site audits to ensure compliance to the stormwater management plan.

This document may be updated and amended as required during preconstruction, construction and post construction phases.

# APPENDIX A – TYPICAL ROAD CROSS SECTION FROM AN ADJOINING WIND FARM



**APPENDIX B – TYPICAL PLATFORM LAYOUT AND CROSS SECTION FROM AN ADJOINING WIND FARM**



**APPENDIX C – FIGURE DEPICTING STORM WATER MANAGEMENT PLAN IN RESPECT TO CATCHMENT AREAS AND RUN-OFF VOLUMES**



## **APPENDIX D – TYPICAL METHOD STATEMENTS**

### **1. ROADS**

#### **Impofu East Wind Farm**

#### **Method Statement - Access Road Construction**

##### **1. Applicability**

This Method Statement covers the construction of Access Routes and Roads necessary for the development of the Impofu East Wind Farm, including upgrading and resurfacing of existing roads. This method statement must be updated prior to the commencement of the relevant construction activities

##### **2. Type of construction activity**

Excavation, construction and maintenance of access roads to the wind turbines (WTGs), site camp, laydown areas,

##### **3. Timing of Activities**

Throughout the construction period

##### **4. Materials to be used**

- Top soil
- Suitable in-situ material
- Imported G5/G6 gravel wearing course and G7 selected layer
- Water
- Crushed stone, geotextile materials, wire gabion/reno mattress boxes for erosion protection, straw stabilisation, mulch from chipping

##### **5. Equipment and staffing requirements**

- TLB's
- excavators
- dumpers
- tippers
- water carts
- graders
- rollers
- compactor
- Drivers
- foreman
- survey staff
- general workers

## **6. Methodology and or specifications to prevent impacts**

### **6.1 Access Road Specifications**

- The roads within the wind farm site will take the routes agreed in the approved final microsituated layout plan.
- The design requirements are for a road capable of carrying large vehicles approximately 70 to 80 m long with axle weights of up to 20t.
- The surface will be an imported and compacted G5/G6 gravel wearing course.
- The roads will not be surfaced but would be designed to standards that ensure control of water and integrity of the road materials with limited maintenance.
- The road width will be increased proportionately for bends and passing/turning places.
- The road alignment and gradients will be set out to fit existing landforms as far as possible and shall be marked out prior to commencement of the works.
- Roadside drains shall have a depth of approximately 450 mm below the edge of roadway and a minimum longitudinal gradient of about 0,5%.
- Settlement ponds and barriers will be provided in and adjacent to the drains to avoid pollution and sedimentation of watercourses.
- Erosion protection will be implemented in disturbed areas with steep gradients to limit ground erosion in these areas.
- Direct drainage from roadside drains into watercourses will be minimized if and where applicable
- Cut-and-fill operations will be designed to achieve a good balance where possible and will be designed to cause the minimum amount of impact to the area.
- Topsoil will be used to dress the slopes and verges if required.

### **6.2 Existing Road-Track (or Cattle Walkway) Widening**

- Widening will be undertaken in line with National/Provincial/Municipal specifications.
- A walk-over will be conducted and any soft or rutted areas identified and dealt with prior to any large construction plant arriving.
- Sections of road requiring minor widening will be excavated to a suitable formation.
- Several sections of track will require widening in areas with steep cross falls. Areas requiring fill to be placed to comply with longitudinal gradients will be designed to minimise the overall footprint of the embankment.
- Site-won material will be placed and compacted in layers to the required profiles. Areas in cuttings will be designed to cut more into the high side to minimise the impact of the road widening.
- Additional G5/G6 gravel wearing course might be required and will be imported as/when needed

### **6.3 New Access Track Construction**

- The new access road construction will follow the same design principle as the road widening.
- Areas of cut-and-fill will be designed to achieve a suitable balance.
- Track footprints will be designed to cause the minimum of disruption.
- Where the removal of trees is required, the area will be felled according to the Vegetation and Landscaping Plan and in line with standard procedures, and where appropriate, the stumps will be removed. In areas clear of trees the area will be cleared of all vegetation. All topsoil will be stockpiled in windrows along the edges of the roads for use during reinstatement. Material removed from cuttings will be hauled to fill areas where suitable.
- Suitable material from cut or quarry/borrow pit will be spread and compacted in layers to the designed levels. An imported layer of compacted G5/G6 gravel wearing course will be constructed as the surfacing layer.
- Drainage ditches will be provided on either side of the tracks, where and if required, and culverts crossings will be provided if and where necessary to optimize stormwater flow.

### **6.4. Existing Roads- Stream Crossings**

- A walk-over will be conducted and any soft or rutted areas identified and dealt with prior to any large construction plant arriving.
- Activity is to be strictly limited to existing road width. "No Go" demarcations are to be erected on either side of track.
- 1.5 m wide bidim geotextile to be spanned along the length of road on either side to prevent any material entering wetlands/streams.
- Suitable material from cut or quarry/borrow pit will be spread and compacted in layers to the designed levels. An imported layer of compacted G5/G6 gravel wearing course will be constructed as the surfacing layer.
- Bidim geotextile containing trapped material to be carefully removed by hand from site and content disposed of at facility approved by ECO.

### **6.5 Turbine hardstands**

- Areas of cut-and-fill will be designed to achieve a suitable balance.
- Track footprints will be designed to cause the minimum of disruption.
- Where the removal of trees is required, the area will be felled according to the Vegetation and Landscaping Plan and in line with standard procedures, and where appropriate, the stumps will be removed. In areas clear of trees the area will be cleared of all vegetation. All topsoil will be stockpiled in windrows along the edges of the hardstands for use during reinstatement. Material removed from cuttings will be hauled to fill areas where suitable.
- Suitable material from cut or quarry/borrow pit will be spread and compacted in layers to the designed levels. An imported layer of compacted G5/G6 gravel wearing course will be constructed as the surfacing layer.
- Drainage ditches will be provided on either side of the hardstands, where and if required.

## **6.6 Dust Control**

- Refer to specifications in the Dust Control Method Statement.

## **6.7 Rehabilitation**

- Rehabilitation activities will take place in accordance with the Rehabilitation Method Statement.
- Following the completion of the earthworks phase, the edges of the access roads will be top-soiled with topsoil material from site to permit the establishment of vegetation along the side of the track. The vegetation will start to green the edges of the tracks, reducing future scour.
- As the track will have limited use during the operational phase, impact during operational phase will negligible.

## **7. Compliance**

Compliance to the specifications will be monitored by the Environmental Site Officer on a daily basis. Any non-compliance will be reported to the Site Agent and will further be recorded in the daily site environmental diary and reported to the Environmental Control Officer in terms of weekly reporting.

## **8. Water**

All water required (dust suppression, etc.) will be drawn from temporary storage tanks.

## **9. Emergency or disaster incident and reaction procedures**

Refer to Emergency Incident Method statement

## **10. Additional Information**

**Nil.**

## 2. EXCAVATION

### Impofu East Wind Farm

#### Method Statement – Excavation, Trenching & Backfilling

##### 1. Applicability

This Method Statement covers the excavation requirements for the development of the Impofu East Wind Farm. This method statement must be updated prior to the commencement of the relevant construction activities.

##### 2. Type of construction activity

Excavation, construction, installation activities including access roads to the wind turbines (WTGs), site camp, laydown areas, substation and associated infrastructure.

##### 3. Timing of Activities

Throughout the construction period

##### 4. Materials to be used

- Top Soil
- Subsoil
- Stockpiles
- Layerworks
- Borrow material

##### 5. Equipment and staffing requirements

- TLB's
- Excavators
- Dumpers
- Rollers
- Tippers
- Water trucks
- Compactors
- Drivers
- Foreman,
- Survey staff
- General workers

##### 6. Methodology and or specifications to prevent impacts

###### 6.1 Stormwater Management

During construction with a particular focus on excavation the Contractor shall protect areas susceptible to erosion by installing all the necessary temporary and permanent drainage works as soon as possible.

###### 6.2 Clearing and Stockpiling of Topsoil and Vegetation

- Clearing and grubbing of topsoil will be carried out to a depth of approximately 150 mm, where applicable.
- Topsoil will be pushed into stockpiled in windrows adjacent to the particular works activity and maintained for reuse during rehabilitation.
- Topsoil stockpile will be free-draining and protected from erosion.
- Topsoil stockpiles will not exceed 2 m in height.

- Topsoil will not be mixed with other materials, such as building rubble, rock etc.
- Topsoil is to be handled twice only – once during clearing and stockpiling and once during rehabilitation
- The stockpiles shall be monitored, and dampened when necessary to control dust.
- No driving of vehicles on the topsoil stockpiles will be permitted.
- No blanket clearing of vegetation will be permitted.
- All “no go” areas will be avoided as not to disturb the existing vegetation/natural features.

### **6.3 Earthworks/Roadworks**

- On completion of the removal of the topsoil, the existing material shall be excavated to boxcut level.
- Material will be excavated using an excavator which will be operated by a competent person and transported with trucks to the stockpile areas on site.
- Layerworks will then be imported and tipped within the roadway.
- Road layers will be processed using a grader, and will be operated by a competent operator.

### **6.4 Trenching**

- The trenches shall be excavated by an excavator.
- Topsoil and subsoils will be placed separately
- The excavated material will be placed one side of the trench.
- The same side of the trench will be utilized for access to the trench for materials.
- Once the construction is completed the trenches shall be backfilled utilizing the excavated material.
- Excess material shall be removed and spoiled at approved site.
- Dimensions of trench are typically 1 m deep and 0.6 m wide
- Trenching to occur only within existing road over stream crossings
- Trenching over any stream crossings to be supervised by ECO
- Ensure trench is demarcated, signed and safe if left unattended

### **6.5. Backfilling**

- Backfilling to commence once cable has been installed, inspected and signed off by client.
- Ensure the trench is free from any objects that can cause damage to the cable or equipment.
- Install bedding soil and spread evenly across the trench
- Install blanket soil and spread soil evenly across cable. Care must be taken not to damage the cable.
- Install first layer of backfill. Spread evenly and stamp down
- Install danger warning tape according to specifications and drawing
- Install remainder of backfill and ensure it is spread evenly.
- Compact backfill at layers of approximately 300 mm
- Install topsoil and make good the area of excavation
- All unsuitable backfill material to be removed to approved spoil site

### **7. Water**

Any water requirements to be supplied from temporary storage tanks on site.

### **8. Rehabilitation**

Refer to Rehabilitation Method Statement.

**9. Compliance**

Compliance to the specifications will be monitored by the Environmental Site Officer on a daily basis. Any non-compliance will be reported to the Site Agent and will further be recorded in the daily site environmental diary and reported to the Environmental Control Officer in terms of weekly reporting.

**10. Emergency or disaster incident and reaction procedures**

Refer to Emergency Incident Method Statement.

**11. Additional Information**

Nil.

### **3. CONCRETE & BLINDING**

#### **Impofu East Wind Farm**

#### **Method Statement – Concrete & Blinding**

##### **1. Introduction**

This Method Statement covers the procedures of structural concrete and blinding activities for the WTG foundation for the development of the Impofu East Wind Farm. This method statement must be updated prior to the commencement of the relevant construction activities.

The proposed construction activities will in general consists of the following:

- Concrete Pumping
- Formwork
- Placing of Concrete

##### **2. Applicable Specifications and Standards**

- Environmental Management Programme
- Environmental Authorization
- ISO 14001
- SABS 1200
- Waste Management Plan
- Emergency Procedure Plan

##### **3. Timing of Activities**

Throughout the construction period

##### **4. Resources**

- Supplier Concrete Trucks
- Flow master PC 709 D Static pump with all its pipes
- Stationery planet Booms
- Water



- Poker vibrators - Electrical vibrating equipment
- Generator with drip tray
- Light stands. (Night Work if needed)
- Small power tools
- Drip trays
- Spill kits

**5. Identification of activities and resultant impacts that may result from the activity**

Activity	Impacts
Concrete, fuel and oil spillages	Contamination of surface water features, erosion, siltation, increased turbidity
Hazardous substance handling	Health hazard to workers

**6. Plant inspection and operator training**

All plant will be inspected as per safety procedures prior to the start of the work. Operator medical and competency certificates from an approved training institution must be provided prior to the start of the work.

**7. Methodology and or specifications to prevent impacts**

**7.1. Structural Concrete  
Concrete Pumping**

- The approved ready mix concrete from our supplier will be delivered to the specific WTG foundation of the day.
- A concrete boom pump will be used to distribute the pump mix in to the structure to ensure proper distribution of the product throughout the base.

**Formwork**

Type 1 & Type 2 Steel shutters will be installed according to their design.

**Placing of Concrete**

- The delivery of concrete will be continuous and of suitable design to allow for pumping as well as ease of passage through the rebar.

- High frequency electrical vibrator equipment of sufficient quantity will be used to compact concrete.
- Temporary false forms will be installed for level control on the slopes.
- Concrete placed on slopes will be placed from the bottom to the top to avoid concrete shearing from slipping.
- Concrete will be struck off using conventional rake floats and possible power floats.
- Sufficient standby equipment will be available during the proposed poor dates.
- Heat of hydration will be monitored by means of thermocouples' in the concrete.
- Special thermal blankets will be placed for 7 days after initial set to control the heat of hydration
- Thermal blankets will also assist with the curing of the concrete

## **7.2 Blinding**

### **Preparation for concrete blinding**

- All loose material present should be removed by means of a broom.
- If required by the Engineer water can be sprayed on the surface to suppress dust prior to activity.
- Once approval for blinding is given (after inspection by the Geotechnical Engineer) the operation may commence.

### **Formwork**

Dimensions of the area of blinding will be controlled by means of flexi steel shutter sections at the appropriate height.

### **Placing Blinding**

- Blinding will be discharged directly at designated area.
- The concrete truck will reverse down the constructed ramp and discharged its contents starting from the furthest point.
- The concrete will be compacted using the appropriate vibrating equipment.
- Concrete will be struck off using conventional rake floats and possible power floats.
- Finishing and curing of concrete will occur as per specification.

## **8. Training Requirements**

### **Induction Training**

All personnel relevant to the operation will be inducted and the methodology will be discussed. Task planners to be signed

### **Specific Training**

The relevant personal will receive training on the different small plant which will be used during the operation.

### **Safety Toolbox**

- All employees relating to the activity shall be made aware of the possible risks that may occur during the operation as per approved Risk Assessment.
- A circle meet will be held with all the responsible parties prior to the operation.

## **9. Water**

All water required (batching, etc.) will be drawn from temporary storage tanks.

## **10. Control of Substances Hazardous to Health**

The goal is to identify possible risks and implement a safe system by means of developing a standard safety procedure for this specific operation. Site specific risk assessments identify the potential hazards, associated risks and mitigating controls relating to casting of concrete will be compiled. Staff will be trained on the content of this risk assessment prior to the commencement of the activity and records are retained on site.

In addition to risk assessment training, all employees will receive site specific Site, health, safety and environmental induction prior to commencement of work.

All employees will be issued and be required to use the necessary PPE as determined by the activity risk assessment for example Eye protection, Safety Harnesses if required, Gumboots, Hard hats and Plastic Gloves.

### **Standard Procedures**

- A checker will control the movement of the all ready mix trucks supplying the concrete pump.
- Employees working on heights are required to wear a harness.
- All employees working at heights should be cleared medically.
- The relevant PPE will be worn at all times.

- Base stations will be present at the relevant WTG foundations. This should include a toilet, first aid kit, drinking water, smoking area and communication radio.
- Concrete mixer trucks will deliver and discharged the ready mix concrete.
- Shutter oil will be stored in clearly marked containers.
- Diesel will be transported in diesel bowser / drip trays to be used when filling plant.
- All concrete spills will be cleaned and returned to the concrete batch plant and placed in the designated waste area
- Shutter oil spills to be cleaned using spill kits
- Diesel spills to be cleaned using spill kits
- Ready Mix trucks to be cleaned or washed out at designated cleaning area

## **11. Emergency Procedures**

Refer to Emergency Response Method Statement and Health and Safety Management Plan

### ***Emergency Incidence Avoidance***

- Environmental awareness induction will be given to all employees
- Only trained personnel will handle dangerous substances and goods
- All dangerous goods will be stored in secure areas

### ***Spillages***

In the event that a spill occurs on site, the following immediate action will be taken to limit the amount of spill by isolating and controlling/stopping the source.

- Appropriate actions will be undertaken to prevent/contain contamination of ecologically sensitive area.
- The spill will be contained by applying absorbent material and, in the case of spillage to a watercourse, by the use of booms.
- A spill kit which contains absorbent pads, bags, etc. will be carried on every refueling vehicle.
- All spills should be treated with a matter of urgency.

- In the event of an oil spillage contaminated soil must be removed and stored in a skip dedicated to hazardous waste. The soil will then be disposed of at a registered hazard waste disposal site by the appointed waste disposal service provider.
- The Site Agent, ESO and ECO will be informed of the incident as soon as possible and a spill/incident report will be made out.

## **12. Compliance Monitoring and Record Keeping**

The tasks carried out during that day will be summarised in the daily diary and sent to the Site Agent for approval.

Awareness to this method statement will be established through training sessions at the beginning of each day and keeping of attendance registers.

Concrete will be checked and signed off by the Resident Engineer on completion.

Equipment necessary to test the concrete quality will be available at the site laboratory. Results from the concrete supplier will thus be verified.

Delivery notes from the supplier will be kept at the site office for record keeping.

Compliance to the specifications will be monitored by the Environmental Site Officer on a daily basis. Any non-compliance will be reported to the Site Agent and will further be recorded in the daily site environmental diary and reported to the Environmental Control Officer in terms of weekly reporting.

## **Impofu East Wind Farm Fire Management Plan**

The site is prone to fire and it is imperative that the necessary precautions be implemented to minimise this risk.

### **Construction**

- a) Ensure that all personnel are aware of the fire risk and the need to extinguish cigarettes before disposal, in appropriate waste disposal container.
- b) The risk of fire is highest in the late summer and autumn months, during high wind velocities and dry periods. To avoid and manage fire risk the following steps should be implemented:
- c) Have on site fire-fighting equipment and ensure that all personnel are educated how to use it and procedures to be followed in the event of a fire.
- d) Identify the relevant authorities and structures responsible for fighting fires in the area and shall liaise with them regarding procedures should a fire commence.
- e) Ensure that all the necessary telephone numbers etc. are posted at conspicuous and relevant locations in the event of an emergency.
- f) Should a contractor be found responsible for the outbreak of a fire, he shall be liable for any associated costs.
- g) No open fires shall be allowed on site for the purpose of cooking or warmth. Bona fide braai fires (such braai fires shall be limited to the traditional "month end" braais and not individual daily cooking fires) may be lit within the construction camp or site.
- h) The Contractor shall take all reasonable steps to prevent the accidental occurrence or spread of fire. The Contractor shall appoint a fire officer who shall be responsible for ensuring immediate and appropriate action in the event of a fire. The Contractor shall ensure that all site personnel are aware of the procedure to be followed in the event of a fire. The appointed fire officer shall notify the Fire and Emergency Services in the event of a fire and shall not delay doing so until such time as the fire is beyond his / her control.
- i) The Contractor shall ensure that there is basic fire-fighting equipment on site at all times. This equipment shall include fire extinguishers and beaters. The Contractor shall pay the costs incurred by organisations called to put out fires started by himself/herself, his/her staff or any sub-contractor. The Contractor shall also pay the costs incurred to reinstate burnt areas as deemed necessary by the RE.
- j) Any work that requires the use of fire may only take place at that designated area and as approved by the RE. Fire-fighting equipment shall be available in these areas.
- k) The Contractor shall ensure that the telephone number of the local Fire and Emergency Service are displayed at the site offices.

*The Contractor is to ascertain the fire requirements and shall submit a fire contingency plan Method Statement to the ECO.*

## **Operation**

Any requirements of the local Fire Protection Association must be adhered in consultation with the relevant landowners as per the requirements of the National Veld and Forest Fire legislation which may include:

- a) Formation of a Fire Protection Association (FPA);
- b) Duty to prepare and maintain firebreaks;
- c) Requirements for firebreaks;
- d) Readiness for fire-fighting;
- e) Actions to fight fires.
- f) In areas other than designated development footprints within the Open Space area, a network of firebreaks must be maintained and overlap with any firebreaks managed by the landowners to ensure that fires are not able to spread over the development.
  - I. All road reserves will serve as firebreak;
  - II. All firebreaks must be maintained as required by the local Fire Chief
- g) Firebreaks are to be positioned and prepared in such a way as to cause the least disturbance to soil and biodiversity. Firebreaks should be free from combustible material, e.g. prunings and leaf litter.
- h) Ensure fire-fighting equipment is maintained and in good working order before the start of each fire season.
- i) Smoking outside of designated safe areas must not be permitted. Flicking of cigarette butts into adjacent vegetation will not be permitted.
- j) Suitable signage must be provided on site, including entrance warning of fire risk and warnings not to flick cigarette butts into vegetated areas.

**IMPOFU EAST WIND FARM  
EROSION MANAGEMENT PLAN**

**PRODUCED FOR RED CAP  
IMPOFU EAST (PTY) LTD**

**BY**



**April 2019**



## ***PURPOSE***

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The purpose of the Impofu East Wind Farm erosion management plan is to implement avoidance and mitigation measures to reduce the erosion potential and the likely impact of erosion associated with the construction and operational phases of the proposed development. As part of the management plan, measures to protect hydrological features from erosion damage are included.

## ***SCOPE & LIMITATIONS***

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This plan is intended at introducing measures aimed at reducing the negative impacts of erosion on biodiversity as well as reducing the vulnerability of the site to erosion problems during the construction and operational phases of the development. The focus is on managing runoff and reducing the construction phase impact on ecologically sensitive areas. The plan does not cover engineering-side issues which are of relevance to soil management and erosion. Therefore, issues such as the potential presence of heaving clays, compressible soils, perched water tables, dispersive soils and corrosive groundwater at the site are beyond the general scope of this study and are not directly dealt with. These issues would need to be addressed and their relevance assessed during detailed geotechnical investigation of the site.

## ***RELEVANT ASPECTS OF THE SITE***

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The infrastructural footprint of the proposed wind farm is located on coastal plains at an altitude of between 180 and 250 metres. Slopes across the site are almost entirely less than 5% but may be greater in a few isolated spots (Lanz, 2019).

Most of the site is characterised by sandy to very sandy soils, with underlying clay and rock respectively (Lanz, 2019).

There are some areas where infrastructure is proposed where steep slopes occur. Consequently, specific measures to regulate runoff at these areas should form part of the final design and construction phases of the development.

## ***BACKGROUND***

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### *Types of Erosion*

Erosion comes in several forms, some of which are not immediately obvious. The major types of erosion are briefly described below:

#### **Raindrop impact**

This is the erosion that occurs due to the “bomb blast” effect of raindrop impact. Soil particles can be

blasted more than a meter into the air. Apart from loosening soil particles, the effect can also break soil aggregates apart and form a clay seal on the surface which resists infiltration and results in increased levels of runoff. This effect is most important when large areas of exposed soils are present. If the site is cleared, then this effect will play an important role as it results in the soil surface becoming sealed which reduces infiltration and increases runoff, leading to erosion.

#### **Sheet erosion**

This is the removal of a shallow and uniform layer of soil from the surface. It is caused initially by raindrop splash and then by runoff. Sheet erosion is often difficult to see as no perceptible channels are formed. Accumulated sediment at the bottom of the slope is often the only indicator. This is likely to be an important erosion type at the site given the gently sloping nature of the site and the susceptible soils.

#### **Rill erosion**

This is the removal of soil from the surface whereby small channels or rills up to 300 mm are formed. It is caused by runoff concentrating into depressions, wheel tracks etc. This type of erosion usually occurs on lower slopes and at the site, it is likely to occur on the deeper soils which occur towards the drainage line which forms the southern boundary of the site.

#### **Gully erosion**

This is the removal of soil from the surface and sub-surface caused by concentrated runoff eroding channels greater than 300mm deep. Gully erosion often begins as rill erosion which is not addressed. As with rill erosion, the southern boundary of the site is likely to pose the greatest risk for gully erosion.

#### **Wind erosion**

Wind erosion results from soil particles being picked up, bounced or moved by the wind. Wind erosion is primarily a problem in arid areas and may affect sands soils as well as fine-textured soils. Vegetation cover is usually an effective barrier to wind erosion, but large soils losses or degradation can occur in disturbed areas or on croplands. Given the high clay fraction in the soils at the site, it is not likely that wind erosion will be a significant influence at the site.

Given the slope and other characteristics of the site, the major types of erosion likely to be apparent at the site are sheet erosion and rill erosion, which if unchecked would lead to gully erosion.

## *Promoting Factors*

### **Rainfall characteristics**

High-intensity, short-duration storm events have much greater erosion potential than low intensity, longer duration storm events with the same runoff volume. Intense storms produce larger raindrops, and are more likely to break up the soil and dislodge particles. Rainfall for the site is given as 662 mm per annum (The World Bank Climate Change Knowledge Portal, undated), with rainfall distributed throughout the year.

### **Soil erodibility**

Soil erodibility is determined by the soils ability to resist detachment and transport due to rainfall, runoff and infiltration capacity. Well-structured soils with a high clay content are generally least erodible. Some clays are dispersible meaning that they break down when wet and become highly erodible. Silts and fine sands are highly erodible.

### **Length and steepness of slope**

Steeper slopes cause runoff flow velocities to increase, resulting in increased erosion. As the slope length increases the opportunity for runoff to concentrate and achieve an erosive velocity increases. Given the steeper slopes in parts of the site, there is opportunity for flow from different sources to accumulate and increase in erosive power

### **Soil surface cover**

Soil surface cover such as vegetation and mulch protect the soil surface from raindrop impact, reduce flow velocity, disperse flow, and promote infiltration and the deposition of sediment. This is a basic principle underlying many erosion control approaches which aim to modify the surface characteristics in order to reduce the flow velocity and reduce the potential for erosion. In this regard it is important to note that many of the practices which are used to enhance rehabilitation potential are also useful in reducing erosion potential.

## ***EROSION AND SEDIMENT CONTROL PRINCIPLES***

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The goals of erosion and sediment control during and after construction at the site should be to:

- Protect the land surface from erosion;
- Intercept and safely direct run-on water from undisturbed upslope areas without allowing it to cause erosion within the site or become contaminated with sediment.
- Progressively revegetate or stabilise disturbed areas.
- Prevent damage to hydrological features such as drainage lines or wetlands, either within or adjacent to the site.

These goals can be achieved by applying the following principles:

1. Integrate project design with site constraints.
2. Plan and integrate erosion and sediment control with construction activities.
3. Minimise the extent and duration of disturbance.
4. Control stormwater flows onto, through and from the site in stable drainage structures.
5. Use erosion controls to prevent on-site damage.
6. Use sediment controls to prevent off-site damage.
7. Control erosion and sediment at the source.
8. Stabilise disturbed areas promptly.
9. Inspect and maintain control measures.

## ***ON-SITE EROSION MANAGEMENT***

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Exposed and unprotected soils are the main cause of erosion in most situations. Therefore, the erosion management plan and the revegetation and rehabilitation plan should be closely linked to one another and should not operate independently, but should rather be seen as complementary activities within the broader environmental management of the site and should therefore be managed together.

General factors to consider regarding erosion risk at the site includes the following:

- Soil loss will be greater during wet periods than dry periods. Intense rainfall events outside of the wet season, such as occasional unseasonal showers can also however cause significant soil loss. Therefore, precautions to prevent erosion should be present throughout the year.
- Soil loss is related to the length of time that soils are exposed prior to rehabilitation or stabilization. Therefore, the gap between construction activities and rehabilitation should be minimized. Allied to this the fact that topsoil does not store well and should preferably be used within a month or at most within 3 months to aid in the revegetation and rehabilitation of disturbed areas.
- Phased construction and progressive rehabilitation are important elements of the erosion control strategy.
- The extent of disturbance will influence the risk and consequences of erosion. Therefore, large areas should not be cleared at a time, especially in areas such as slopes where the risk of erosion is higher.

## ***SPECIFIC RECOMMENDATIONS TO REDUCE EROSION POTENTIAL AND DEGRADATION OF WETLANDS AND DRAINAGE SYSTEMS***

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The construction of access roads, other infrastructure as well as cable trenching may impinge on wetlands and drainage systems and thus precautions should be taken in these situations to reduce their potential impact.

### *Concentration of flows into downstream areas*

Road crossings over drainage lines, streams and wetlands can impact downstream wetland ecosystems. Crossings that result in narrowing of the downstream system can result in concentration of flows and channelisation downstream. This may result in a loss of wetland function, and result in the drying out

and shrinkage of the wetland area. Erosion and increased vulnerability to invasion of drier banks by alien vegetation may occur.

- Culverts should be adequately spaced such that they do not result in shrinkage of downstream wetlands. Where roads cross minor drainage channels, a single culvert may be adequate, aligned with the downstream drainage line. Where more substantial wetland systems are intercepted by a road, sufficient culverts should be provided such that downstream shrinkage of wetland width does not occur. Moreover, culverts should be aligned, as far impossible, with existing, natural channels.
- All crossings of drainage systems should ensure that both surface and shallow subsurface flows can be accommodated where appropriate and that unnatural channelisation does not occur downstream.

### *Runoff Concentration*

The increase in hardened surfaces associated with the hardstands, roads and other infrastructure, will lead to a significant increase in the volume and velocity of flow generated from these areas during large rainfall events.

- Runoff from road surfaces is usually channeled off of the road surface towards the downslope side of the road. On steep slopes, the volumes and velocity of runoff generated may result in erosion of the surrounding areas. Therefore specific measures to curb the speed of runoff water is usually required in such areas, such as rock beds or even gabions. In addition, these areas should be monitored for at least a year after construction to ensure that erosion is not being initiated in the receiving areas. Once erosion on steep slopes has been initiated, it can be very difficult to arrest.

### *Diversion of flows*

Diversion of flows from natural drainage channels may occur when roads interrupt natural drainage lines, and water is forced to run in channels along the manipulated road edge to formalized crossing points. Even slight diversion from the natural drainage line can result in excessive downstream erosion, as the new channel cuts across the slope to reach the valley bottom. Should the access road to the site traverse any major drainage lines, the following principles should apply.

- Adequate culverts should be provided along the length of all roads to prevent diversion of flow from natural drainage lines.
- Culverts should be carefully located, such that outlet areas do in fact align with drainage lines.
- The downstream velocity of runoff should be managed, such that it does not result in downstream erosion – on steep slopes, where roads have been constructed on cut areas, allowance should be made for culverts to daylight sufficiently far down the slope that their velocities are managed and erosion does not occur.

- Where necessary, anti-erosion structures should be installed downstream of road drains – these may comprise appropriate planting, simple riprap or more formal gabion or other structures.
- Roads and their drainage system should be subject to regular monitoring and inspection, particularly during the wet season, so that areas where head cut erosion is observed can be addressed at an early stage.

## ***MONITORING REQUIREMENTS***

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### *Construction Phase*

The following monitoring actions should be implemented during the construction phase of the development.

<b>Monitoring Action</b>	<b>Indicator</b>	<b>Time frame</b>
Identify all river and drainage line crossings affected by the development	Map of sites of potential concern	Preconstruction
Monitor cleared areas for erosion problems	Record of monitoring site, problems encountered and remedial actions implemented	Monthly during the rainy season and following significant rainfall events otherwise
Monitor vegetation clearing activities near sensitive areas such as wetlands or drainage lines	Activity log of monitoring actions and any mitigation and avoidance measures implemented	Monthly during the rainy season and following significant rainfall events otherwise
Monitor revegetated and stabilised areas	Record of monitoring site, problems encountered and remedial actions implemented	Monthly during the rainy season and following significant rainfall events otherwise

### *Operational Phase*

The following monitoring actions should be implemented during the operational phase of the development.

<b>Monitoring Action</b>	<b>Indicator</b>	<b>Time frame</b>
Monitor for the development of new erosion problems across the site, with a focus on areas where water has been diverted or collected from upslope onto downslope areas	Map of erosion problem areas	Quarterly
Document erosion control measures implemented	Records of control measures and their success rate.	Quarterly
Document the extent of erosion at the site and the remedial actions implemented	Decline in erosion and vulnerable bare areas over time	Biannually