SOUTH AFRICA MAINSTREAM RENEWABLE POWER NOUPOORT (PTY) LTD

Proposed Construction of a Wind Farm near Noupoort, Northern Cape Province, South Africa

Final Environmental Management Programme

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SOUTH AFRICA MAINSTREAM RENEWABLE POWER NOUPOORT (PTY) LTD

CONSTRUCTION OF A WIND FARM NEAR NOUPOORT, NORTHERN CAPE PROVINCE OF SOUTH AFRICA

FINAL ENVIRONMENTAL MANAGEMENT PROGRAMME

EXECUTIVE SUMMARY

South Africa Mainstream Renewable Power Noupoort (Pty) Ltd (hereafter referred to as, "the Project Company") has appointed SiVEST to undertake the EIA process and the Final EMPr for the proposed construction of a wind farm near Noupoort in the Northern Cape Province of South Africa. The objective of the project is to develop a wind farm in order to generate electricity to feed into the national grid. The project is also in line with the government's commitment to provide renewable energy as an alternative energy source to those currently utilized.

Having received Environmental Authorisation (EA) for the EIA process, it is required that the EMPr is to be finalised and submitted to the Department of Environmental Affairs (DEA) as the determining authority for final approval prior to construction.

A Final Environmental Management Programme (EMPr) is a detailed plan for the implementation of the mitigation measures to minimise the negative environmental impacts highlighted in the Final Environmental Impact Report (FEIR) (dated 13th April 2012). The Final EMPr will contribute to the preparation of the contract documentation between the Project Company and the contractor(s) that will carry out construction, by developing clauses to which the contractor(s) must adhere for the protection of the environment. The Final EMPr for the proposed project will include a construction environmental monitoring plan specifying how the construction of the project is to be carried out. The Final EMPr describes the mitigation measures that need to be undertaken to ensure environmental good practice during the pre-construction, construction, operational and decommissioning phases of the proposed project.

The Noupoort Wind Farm (here after referred to as the proposed project) is located in the Northern Cape Province of South Africa and falls under the Umsobomvu Local Municipality in the greater Pixley ka Seme District Municipality, Northern Cape Province. Noupoort is approximately 53 km south east of the town of Colesberg, 35km north of Middelburg and 55km south west of Hanover town.

The final layout of the Noupoort Wind Farm is shown in **Figure i** below. The Noupoort Wind Farm will have a capacity of 80MW and will consist of 35 wind turbines. The wind turbines will have a hub height of up to 120m. The rotor diameter will be up to 120m. The wind turbines will not be fixed and will be able to rotate to catch prevailing winds. The foundation of each wind turbine will be approximately 20m x 20m. The footprint for each wind turbine will therefore be approximately 400m². A hard standing area, of approximately 2 400m², for crane usage will accompany each wind turbine. Hence, the total footprint for each wind turbine and the associated hard standing area will be approximately 2 800m². The foundation will be up to approximately 2.5m deep. The wind turbines will be connected by underground cabling (approximately 1m deep) except where the cable cannot be buried. In this instance an overhead power line will be used. To connect the wind farm to the national electricity grid, a 132kV overhead power line will be constructed that will route from the substation on site towards the south west where it will tie into an existing 132kV overhead power line that routes into Noupoort. The power line will be approximately 13km in length. A substation will be constructed on the wind farm site which will occupy an area of 100m x 100m (approximately 10 000m²). An access road will be constructed that will be 6-10m wide. The roads will be gravel roads and will include turning circles for large trucks and passing points A temporary lay-down area is to be established which will be approximately 5 000m² (including an access route and contractor's site). Other infrastructure will include an administration and warehouse building that will occupy an area of up to 5 000m².

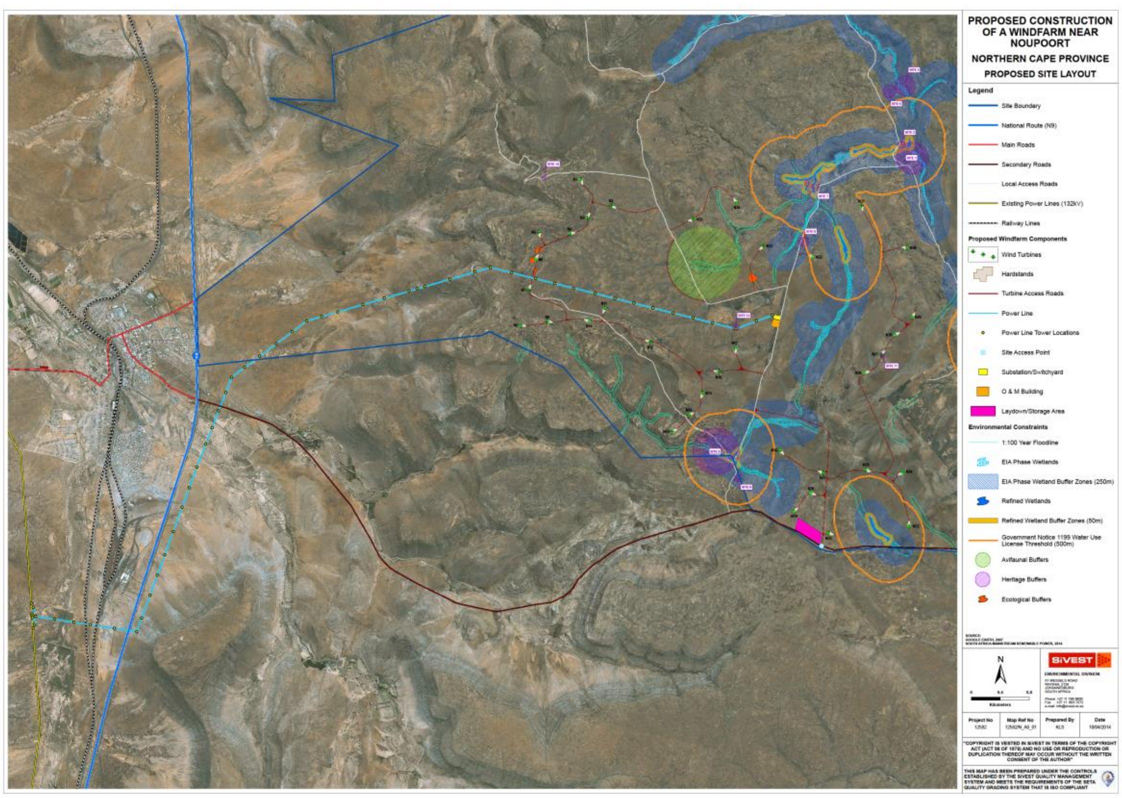

Figure i: Noupoort Wind Farm Final Layout

The Project Company appointed SiVEST (Pty) Ltd to undertake and compile the Final EMPr in an effort to ensure environmental best practice by describing the mitigation measures that need to be undertaken to ensure environmental good practice during the pre-construction, construction, operational and decommissioning phases of the proposed project.

This EMPr has been compiled in line with the recommendations in the above-mentioned FEIR, the Environmental Authorisation (EA), dated 29 October 2012 including subsequent minor amendments, from the DEA as well as from issues identified by SiVEST Environmental Division. Additionally, the following specialist walk-down studies as well as monitoring studies were undertaken and the proposed mitigation measures and recommendations were integrated into the Final EMPr (including final layout):

- Twelve Month Avi-faunal Monitoring Assessment;
- Twelve Month Bat Monitoring Assessment;
- Avi-faunal Walk-down Assessment;
- Biodiversity Walk-down Assessment; and
- Heritage Walk-down Assessment.

The EMPr has set out the conditions for the implementation of mitigation measures as well as the environmental management for all personnel involved in the project. The stipulated mitigation measures are described in detail for the per-construction, construction, operational and decommissioning phase of the proposed project. It also outlines the roles and responsibilities of all personnel involved in the proposed project.

SOUTH AFRICA MAINSTREAM RENEWABLE POWER NOUPOORT (PTY) LTD

CONSTRUCTION OF A WIND FARM NEAR NOUPOORT, NORTHERN CAPE PROVINCE OF SOUTH AFRICA

FINAL ENVIRONMENTAL MANAGEMENT PROGRAMME

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Glossary of terms:

Alien Invasive Species: A species occurring in an area outside of its historically known natural range as a result of intentional or accidental dispersal by human activities.

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

Construction Phase: The activities pertaining to the preparation for and the physical construction of the proposed development.

Contractor: Persons/organisations contracted by the Project Company to carry out parts of the work for the proposed development.

Contractor Project Manager: Person/oranisations contracted by the Project Company to establish and manage project contracts management between of the Main Contractor and the appointed Sub-Contractors.

Decommissioning: Means to take out of active service permanently or dismantle partly or wholly, or closure of a facility to the extent that it can not be readily recommissioned.

Environmental Control Officer (ECO): Person/organisation appointed by the Project Company who will provide direction to the Project Manager concerning the activities within the Construction Zone, and who will be responsible for conducting the environmental audit of the project during the construction phase of the project according to the provisions of the Environmental Management Programme.

Environmental Impact Assessment: In relation to an application, to which Scoping must be applied, means the process of collecting, organising, analysing, interpreting and communicating information that is relevant to the consideration of the application. In accordance with the environmental legal requirements set out in GNR. No 543, GNR. 544, GNR. 545 and GNR 546 as published in Government Gazette No. 33411 of 2 August 2010, promulgated in terms of Chapter 5 of the National Environmental Management Act (No 107 of 1998), for the purposes of obtaining an Environmental Authorisation in accordance with Chapter 5 of the National Environmental Management Act.

Environmental Management Programme (EMPr): The EMPr is a detailed plan for the implementation of the mitigation measures to minimise negative environmental impacts during the life-cycle of a project. The EMPr contributes to the preparation of the contract documentation by developing clauses to which the contractor must adhere for the protection of the environment. The EMPr specifies how the construction of the project is to be carried out and includes the actions required for the Post-Construction Phase to ensure that all the environmental impacts are managed for the duration of the project's life-cycle.

Environmental Officer: Person/organisation appointed by the Project Company who will manage the daily on-site implementation of the environmental aspects outlined in the EMPr. The Environmental Officer will liaise with the Project Manager, Main Contractor and Sub-Contractors regarding the construction activities for the duration of the project.

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

Implementation Agreement: An agreement between the Project Company and the Department of Energy that details the direct contractual obligations and undertakings that will need to occur. The agreement includes clauses to deal with operational and contractual operation of the project, and specifically includes Economic Development Obligations. These include Job Creation, Local Content, Ownership, Management Control, Preferential Procurement, Enterprise Development and Socio Economic Development that the project has committed to delivering.

Interested and Affected Parties (I&APs): Any person or group of people concerned with or affected by an activity and its consequences. These include the authorities, local communities, investors, work force, customers and consumers, environmental interest groups, and the general public (after the Environmental Impact Assessment Regulations of September 1997 and Guideline Document: Environmental Impact Assessment Regulations of April 1998).

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

Operational Phase (Post-construction): The period following the Construction Phase, during which the proposed development will be operational.

Pollution: Any change in the environment caused by substances or noise, malodours, dust or heat emitted from any activity, including the storage or treatment of waste or substances, construction and the provision of services, 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

Pre-Construction Phase: The period prior to commencement of the Construction Phase, during which various activities associated with the preparation for the Construction Phase will be undertaken.

Project Company: South Africa Mainstream Renewable Power Noupoort (Pty) Ltd

Project Manager (PM): Person/ organisation appointed by the Project Company to oversee the work of all consultants, sub-developers, contractors, residents and visitors.

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

Rehabilitation: Rehabilitation is defined as the return of a disturbed area to a state which approximates the state (where possible) which it was in before disruption. Rehabilitation for the purposes of this specification is aimed at post-reinstatement re-vegetation of a disturbed area and the insurance of a stable land surface. Re-vegetation should aim to accelerate the natural succession processes so that the plant community develops in the desired way, i.e. promote rapid vegetation establishment.

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

Site Manager: The person, representing the Contractor, responsible for all the Contractor's activities on the site including supervision of the construction staff and activities associated with the Construction Phase. The Site Manager will liaise with the Project Manager in order to ensure that the project is conducted in accordance with the Environmental Management Programme

Social Officer: Person/organisation appointed by the Project Company who will manage the daily on-site implementation of the social aspects outlined in the EMPr. The Social Officer will liaise with the landowners and relevant I&APs regarding the construction activities for the duration of the project.

Solid waste: All solid waste, including construction debris, chemical waste, excess cement / concrete, wrapping materials, timber, steel, drums, wire, nails, food and domestic waste (e.g. plastic bags and wrappers).

Abbreviations:

C	Contractor
DAFF	Department of Agriculture, Forestry and Fisheries
DEA	Department of Environmental Affairs
DWA	Department of Water Affairs
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EO	Environmental Officer
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
EP	Equator Principles
EPCM	Engineering Procurement and Contracts Management
ESS	Environmental Scoping Study
EWT	Endangered Wildlife Trust
FEIR	Final Environmental Impact Report
IFC	International Finance Corporation (World Bank Group)
I&APs	Interested and Affected Parties
MC	Main Contractor
MSDS	Material Safety Data Sheets
MRP	Mainstream Renewable Power
NEMA	National Environmental management Act 9Act 107 of 1998)
NHRA	National Heritage Resources Act, 199 (Act 25 of 1999)
NWA	National Water Act, 1998 9Act 36 of 1998)
OECD	Organisation for Economic Co-operation and Development
PM	Project Manager
SM	Site Manager
SO	Social Officer

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FINAL ENVIRONMENTAL MANAGEMENT PROGRAMME

1 INTRODUCTION

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This EMPr has been compiled in line with the recommendations in the above-mentioned FEIR, the Environmental Authorisation (EA), dated 29 October 2012 including subsequent minor amendments, from the DEA as well as from issues identified by SiVEST Environmental Division. Additionally, the following specialist walk-down studies as well as monitoring studies were undertaken and the proposed mitigation measures and recommendations were integrated into the Final EMPr:

- Twelve Month Avi-faunal Monitoring Assessment;
- Twelve Month Bat Monitoring Assessment;
- Avi-faunal Walk-down Assessment;
- Biodiversity Walk-down Assessment; and
- Heritage Walk-down Assessment.

It must be noted however, that the micro siting of infrastructure due to the recommendations for the following areas are currently, where possible, being undertaken and the updated final layout map will be available to the DEA before the activity commences:

- New access roads between wind turbine locations N5, N6 and N7 that are within ecologically sensitive areas;
- Wind turbine N6 in an ecologically sensitive area;
- New access road to be constructed from existing road leading to wind turbine location N32 that is inside wetland buffer zone;
- New access road to be constructed from existing road leading to wind turbine location N33 that is in within an ecological sensitive area;
- Wind turbine N27 inside a heritage site 11 buffer; and
- Overhead power line tower location inside heritage site 12 buffer.

1.1.1 Details of EAP

As per the requirements of the NEMA (2010), the details and level of expertise of the persons who prepared the EMPr are provided in **Table 1** below.

Table 1. Consultant Team

Environmental Project Manager	SiVEST (Pty) Ltd – Kelly Tucker
Contact Details	kellyt@sivest.co.za
Qualifications	B.Sc. Earth Sciences, B.Sc. (Hons) Geography and Environmental Management, M.Sc. Environmental Management, Diploma in Advanced Project Management
Expertise to carry out the EMPr	Kelly is an Environmental Scientist with 10 years' experience across various sectors. She specialises in the overall management and compilation of Environmental Impact Assessments (EIAs) and Environmental Management Programmes (EMPs) primarily related to mining, energy generation and electrical transmission projects. Kelly has extensive knowledge of the South African Environmental legislation as well as World Bank Guidelines and Equator Principles. She has been involved in several projects to which

	these skills have been applied. **Environmental Impact Assessments and Environmental Management Programmes:** ▪ Colenso Power EIA and Mining Application for new Coal fired power station and Coal mine in Coleso near Ladysmith in KwaZulu Natal (2013 – current); ▪ Basic Assessment and Waste License Application for the proposed new Iveco manufacturing plant, Rosslyn, South Africa (2013 – current); ▪ Environmental Advisory Services for the Moloto Development Corridor (MDC) Project which is located between the City of Tshwane Local municipality in Gauteng Province and Groblersdal, Limpopo Province, traversing Mpumalanga Province. Project Leader, SMEC/VelaVKE, 2012 – Current; ▪ Environmental Advisory Services for the Moloto Development Corridor (MDC) Project which is located between the City of Tshwane Local municipality in Gauteng Province and Groblersdal, Limpopo Province, traversing Mpumalanga Province. Project Leader, SMEC/VelaVKE, 2012 – Current; ▪ 3 Year Appointment: Environmental Management Compliance for the Integrated Rapid Transit project for Polokwane Municipality. Project Leader, City of Polokwane, 2013 – Current; ▪ EIA and EMPr for the proposed 150 MW Renosterberg Wind Energy Company (RWEC) Wind Farm and 75 MW Solar Photovoltaic (PV) Plant, Northern Cape Province. The EIA includes the scoping process and detailed environmental impact assessment. The project includes detailed specialist studies such as social, visual, noise, heritage and biophysical as well as a full public participation process. RWEC, 2012 – Current; ▪ EIA and EMP for the new proposed Nsoko Integrated Sugar Mill and Ethanol Plant for Nsoko Msele, in Swaziland (2013); ▪ BA and EMP for the Proposed Bulk Storage Fuel Oil Tank installation at the Grootvlei Power Station, Mpumalanga Province (2011); ▪ BA for the Proposed development of a 19MW Photovoltaic Solar Power Plant near Kimberley, Northern Cape Province

	(2012); ▪ BA for the Proposed development of a 19MW Photovoltaic Solar Power Plant near Danielskuil, Northern Cape Province (2012); ▪ EIA for the proposed Wind Energy and PV Facilities for Mainstream Renewable Power near Loeriesfontein, Northern Cape (2011 – 2012); ▪ EIA for the proposed Wind Energy and PV Facilities for Mainstream Renewable Power near Prieska, Northern Cape (2011 – 2012); ▪ EIA for the proposed Wind Energy and PV Facilities for Mainstream Renewable Power near Noupoort, Northern Cape (2011 – 2012); and ▪ EIA for the proposed CSP and PV Facilities for Mainstream Renewable Power near Kimberley, Northern Cape (2011).
Environmental Scientist	SiVEST (Pty) Ltd – Shaun Taylor
Contact Details	shaunt@sivest.co.za
Qualifications	BA. Geography and Environmental Science, B.Sc (Hons) Geography and Environmental Studies, M.Sc. Aquatic Health
Expertise to carry out the EMPr	Shaun has a passion for working in the environmental and water (wetlands) field. From an environmental management perspective, Shaun has completed a number of environmental impact assessments, basic assessments, environmental management programmes/plans, various exemption and amendment applications, and conducted environmental auditing. **Environmental Impact Assessments:** ▪ Mookodi Integration Project Environmental Impact Assessment (2011/2012); ▪ Environmental Impact Assessment of a Wind farm near Noupoort, Northern Province (2011/2012); ▪ Renosterberg Wind Farm and PV Plant near De Aar, Northern Cape Province (2012); ▪ Proposed Installation of a 500m³ Bulk Storage Fuel Oil Tank at Grootvlei Power Station, Mpumalanga Province (2011/2012); ▪ Proposed development of a 19MW Photovoltaic Solar Power Plant near Kimberley, Northern Cape Province (2012); ▪ Proposed development of a 19MW Photovoltaic Solar Power Plant near Danielskuil, Northern Cape Province (2012); ▪ Frankfort Strengthening Project: 88kV Power Line from

	Heilbron (via Frankfort) to Villiers, Free State Province (2013); ▪ Wilger 132kV Overhead Distribution Power Line, Northern Cape Province (2013); ▪ Limestone 1 – 132kV Overhead Distribution Power Line, Northern Cape Province (2013); and ▪ Limestone 2 – 132kV Overhead Distribution Power Line, Northern Cape Province (2013). **Environmental Management Programmes:** ▪ Eskom Thyspunt Nuclear Integration Project Environmental Management Plan – Transmission Infrastructure (2011); ▪ Eskom Thyspunt Nuclear Integration Project Environmental Management Plan – Substations (2011); ▪ Mookodi Integration Project Environmental Management Plan – Transmission Infrastructure and Substations (2011/12); ▪ Noupoort Wind Farm Environmental Management Programme (2012); ▪ •Environmental Management Programme for a 500m³ Bulk Storage Fuel Oil Tank at Grootvlei Power Station (2012); ▪ Environmental Management Programme for a 19MW Photovoltaic Solar Power Plant near Kimberley, Northern Cape Province (2012); ▪ Environmental Management Programme for a 19MW Photovoltaic Solar Power Plant near Danielskuil, Northern Cape Province (2012); and ▪ Karowe Diamond Mine Environmental Management Plan Review and Update, Boteti District, Botswana (2012); ▪ Environmental Management Programme for the Frankfort Strengthening Project: 88kV power line from Heilbron (via Frankfort) to Villiers, Free State Province (2013).
Junior Environmental Scientist	SiVEST – Veronique Evans
Contact Details	veroniquee@sivest.co.za
Qualifications	B.Sc. Environmental Conservation and Ecology, Geography and Zoology, B.Sc. (Hons). Environmental Conservation and Ecology.
Expertise to carry out the EMPr	Veronique has been involved extensively in the public participation aspect on numerous projects including environmental impact assessments, water use license applications and amendment impact assessments. She has been involved in the compilation of Environmental Impact Assessment

	(EIA) and Basic Assessments (BA) and Environmental Management Plans primarily related to energy generation and electrical distribution projects. She also assists and undertakes visual impact assessments, by making use of ArcGIS technology and undertaking field surveys. **Environmental Impact Assessments and Environmental Management Programmes:** ▪ Basic Assessment (BA) and Environmental management Plan (EMPr) for the proposed construction of a 132kv Power Line, Substation and the extension of Homestead Substation associated with the Concentrating Photovoltaic (CPV) / Photovoltaic (Pv) Plant (PV 3) on the Farm Droogfontein in Kimberley, Northern Cape Province (2012/2013); ▪ Basic Assessment (BA) and Environmental Management Programme (EMPr) for the Proposed Mookodi Integration Phase 2 132kv Power Lines and Ganyesa Substation Near Vryburg, North West Province (2012); ▪ Basic Assessment (BA) for the upgrade of the Silver Lakes outfall sewer pipeline (2012); ▪ Basic Assessment (BA) and Environmental Management Programme (EMPr) for the Proposed construction of the Sheepmoor traction substation with two 20MVA transformer bays and a new associated 88kV turn-in power line, Mpumalanga Province (2013); ▪ Basic Assessment (BA) and Environmental Management Programme (EMPr) for the Proposed rebuild of the 88kV power line from Uitkoms substation to Antra T-off, Mpumalanga Province (2013); ▪ EIA for the proposed 25 MW Community Wind Farm in St Helena Bay, Western Cape Province; ▪ EIA for the proposed 300 MW Caledon Wind Farm, Western Cape Province. The EIA includes the scoping process and detailed environmental impact assessment; ▪ EIA and EMP for the proposed South African Nuclear Energy Corporation (Necsa) Dedicated Isotope Production Reactor (DIPR) at the Pelindaba Site near Hartebeespoort in the North West Province; and ▪ BA for the proposed 25 MW Community Wind Farm in St Helena Bay, Western Cape Province.

1.2 Site Locality and Description

1.2.1 Regional Locality

Noupoort is situated within the Umsobomvu Local Municipality in the greater Pixley ka Seme District Municipality, Northern Cape Province. Noupoort is approximately 53 km south east of the town of Colesberg, 35km north of Middelburg and 55km south west of Hanover town (**Figure 1**). The town of Noupoort is situated off the N9 highway on the main route from the Eastern Cape to Colesberg on the N9 route. There is an existing railway line which runs alongside the N9.

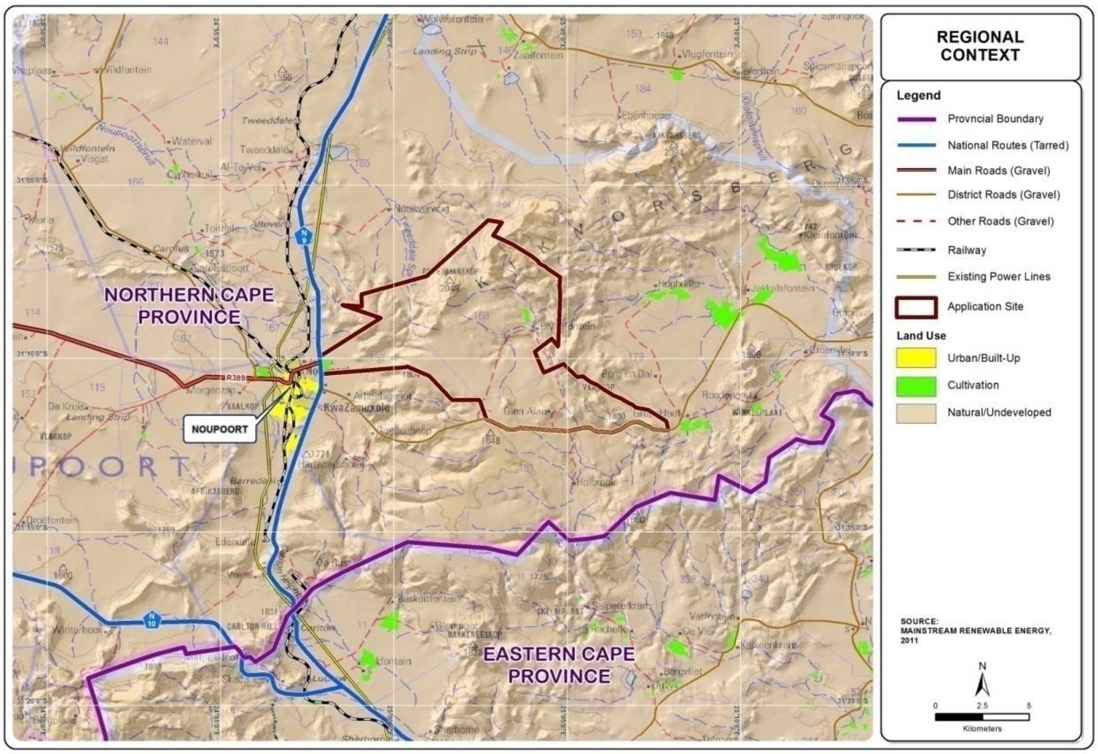


Figure 1: Noupoort Regional Study Area

1.2.2 Study Site Description

The total study area of the Noupoort Wind Farm site made up by the three portions of land is approximately **7 632 hectares** in size (**Figure 2**). The descriptions of the three portions of land and the size of each include:

- Remainder of the Farm No.168, Colesberg, Noord Kaap (approx. 4 745.62 hectares);
- Portion 1 of the Farm No. 181, Colesberg Noord Kaap (approx. 1 469.99 hectares);
- Portion 21 of the Farm No. 182, Colesberg Road, Noord Kaap Harmonie (approx. 1 276.80 hectares).

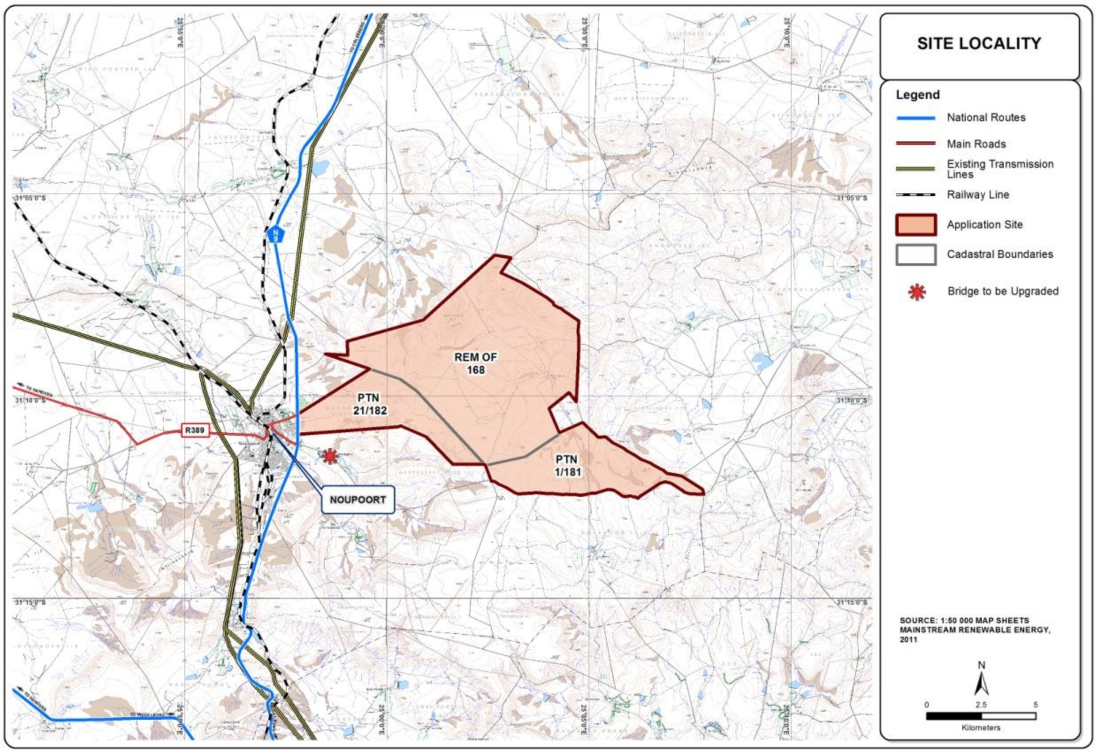


Figure 2: Noupoort Site Locality Map

The power line associated with the Noupoort Wind Farm will also however traverse a number of properties. These include the following:

- Portion 8,14,17 of the Farm No. 1, Middleburg, Noord Kaap
- Remainder of the Farm No. 182, Colesberg, Noord Kaap
- Portion 68 of the Farm No. 182, Colesberg, Noord Kaap
- Portion 17 of the Farm No. 182, Colesberg, Noord Kaap
- Remainder of Portion 21 of the Farm No. 182, Colesberg, Noord Kaap
- Remainder of the Farm No. 168, Colesburg, Noord Kaap

1.2.3 Climate

Noupoort normally receives about 261mm of rain per year, with most rainfall occurring mainly during autumn (www.saexplorer.co.za). It receives the lowest rainfall (2mm) in August and the highest (56mm) in March (www.saexplorer.co.za). The monthly distribution of average daily maximum temperatures shows that the average midday temperatures for Noupoort range from 13.6°C in June to 29.2°C in January (www.saexplorer.co.za). The region is the coldest during July when the mercury drops to 0.2°C on average during the night (www.saexplorer.co.za). An overview of the typical mean monthly and annual precipitation as well as minimum and maximum daily temperatures for Noupoort are shown in **Table 1** below.

Table 2: Mean monthly and annual precipitation and temperature for Noupoort (http://www.saexplorer.co.za/south-africa/climate/noupoort_climate.asp)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Rainfall (mm)	34	45	56	28	15	5	3	2	6	19	26	22	261mm (per annum)
Midday Temp (⁰C)	29	28	25	21	17	14	14	17	20	23	25	28	21 (average)
Night Temp (⁰C)	13	13	11	7	3	1	0	2	4	7	9	11	6 (average)

1.3 Overview of the proposed project

The final layout of the Noupoort Wind Farm is shown in **Figure 3** below. The Noupoort Wind Farm will have a capacity of 80MW and will consist of 35 wind turbines. The wind turbines will have a hub height of up to 120m. The rotor diameter will be up to 120m. The wind turbines will not be fixed and will be able to rotate to catch prevailing winds. The foundation of each wind turbine will be approximately 20m x 20m. The footprint for each wind turbine will therefore be approximately 400m². A hard standing area, of approximately 2 400m², for crane usage will accompany each wind turbine. Hence, the total footprint for each wind turbine and the associated hard standing area will be approximately 2 800m². The foundation will be up to approximately 2.5m deep. The wind turbines will be connected by underground cabling (approximately 1m deep) except where the cable cannot be buried. In this instance an overhead power line will be used. To connect the wind farm to the national electricity grid, a 132kV overhead power line will be constructed that will route from the substation on site towards the south west where it will tie into an existing 132kV overhead power line that routes into Noupoort. The power line will be approximately 13km in length. A substation will be constructed on the wind farm site which will occupy an area of 100m x 100m (approximately 10 000m²). An access road will be constructed that will be 6-10m wide. The roads will be gravel roads and will include turning circles for large trucks and passing points A temporary lay-down area is to be established which will be approximately 5 000m² (including an access route and contractor's site). Other infrastructure will include an administration and warehouse building that will occupy an area of up to 5 000m².

The layout map including the environmental sensitivity overlay as per the FEIR dated 13th April 2012 is shown in Error! Reference source not found.. It must be noted that the final layout will differ somewhat from the layout map including the sensitivity overlay, since it will have been refined following the undertaking of the Avi-fauna, Biodiversity and Heritage final walk-down assessments (**Appendix A**, **B** and **C** respectively). Again it must also be noted that the micro siting of infrastructure due to the final walk-down study specialist's recommendations are currently, where possible, being undertaken and the updated final layout map will be made available to the DEA before the activity commences.

It must also be noted that a follow up wetland assessment was undertaken to refine the findings of the wetland assessment that was undertaken in the EIA phase (and included in the FEIR) to inform the water use license application that has been submitted to DWA. The refined wetland delineations and associated buffers have been incorporated into the final layout map as a result. The Integrated Waste Water Management Plan including the refined wetland delineations and buffer are included in **Appendix D**. The EIA phase wetlands and buffers as well as the refined wetlands and buffers are both shown in **Figure 3**.

The construction phase of the proposed project is expected to take 18 months. The operational phase of the proposed wind farm is 20 years.

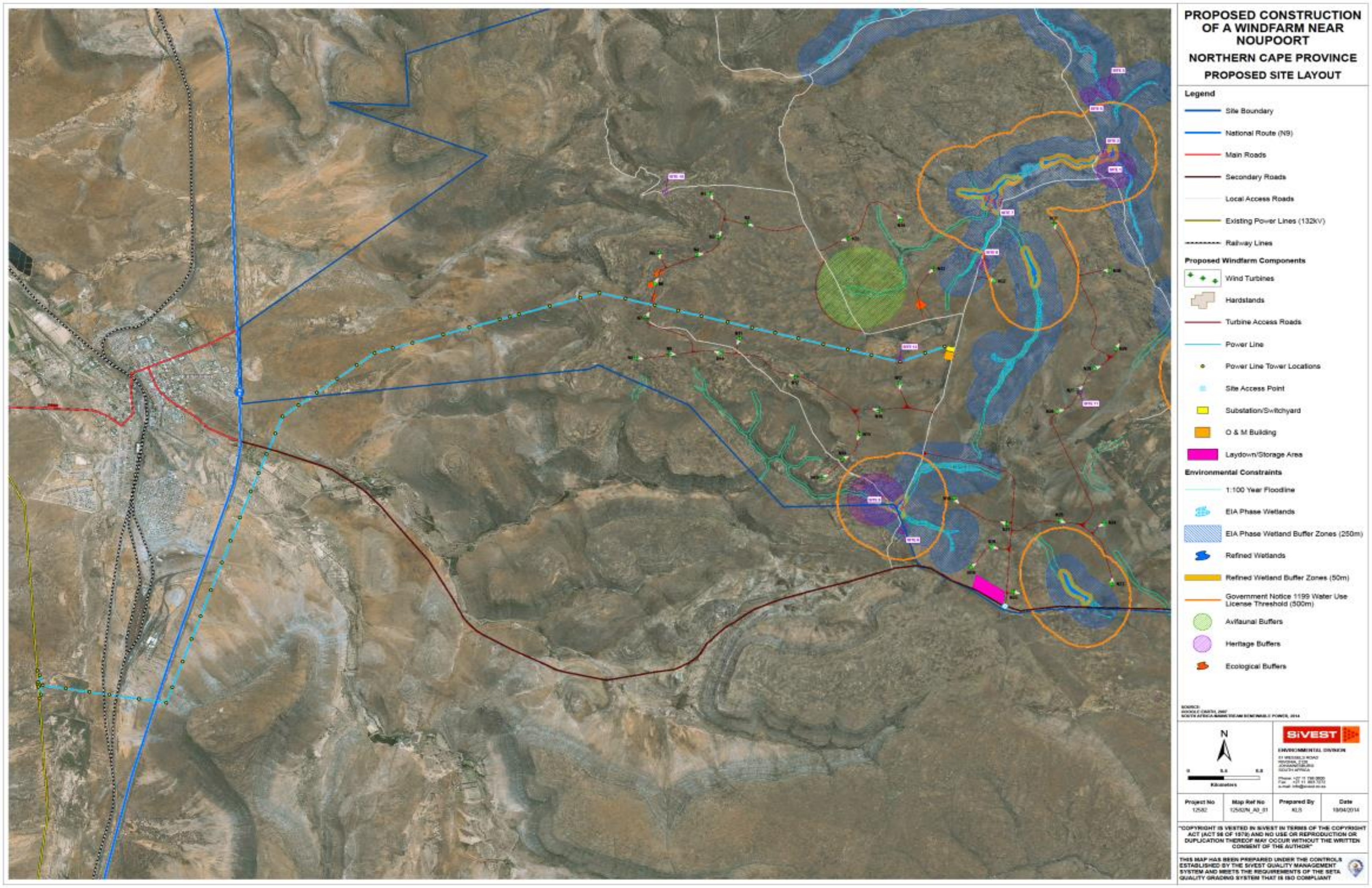


Figure 3: Noupoort Final Layout Map

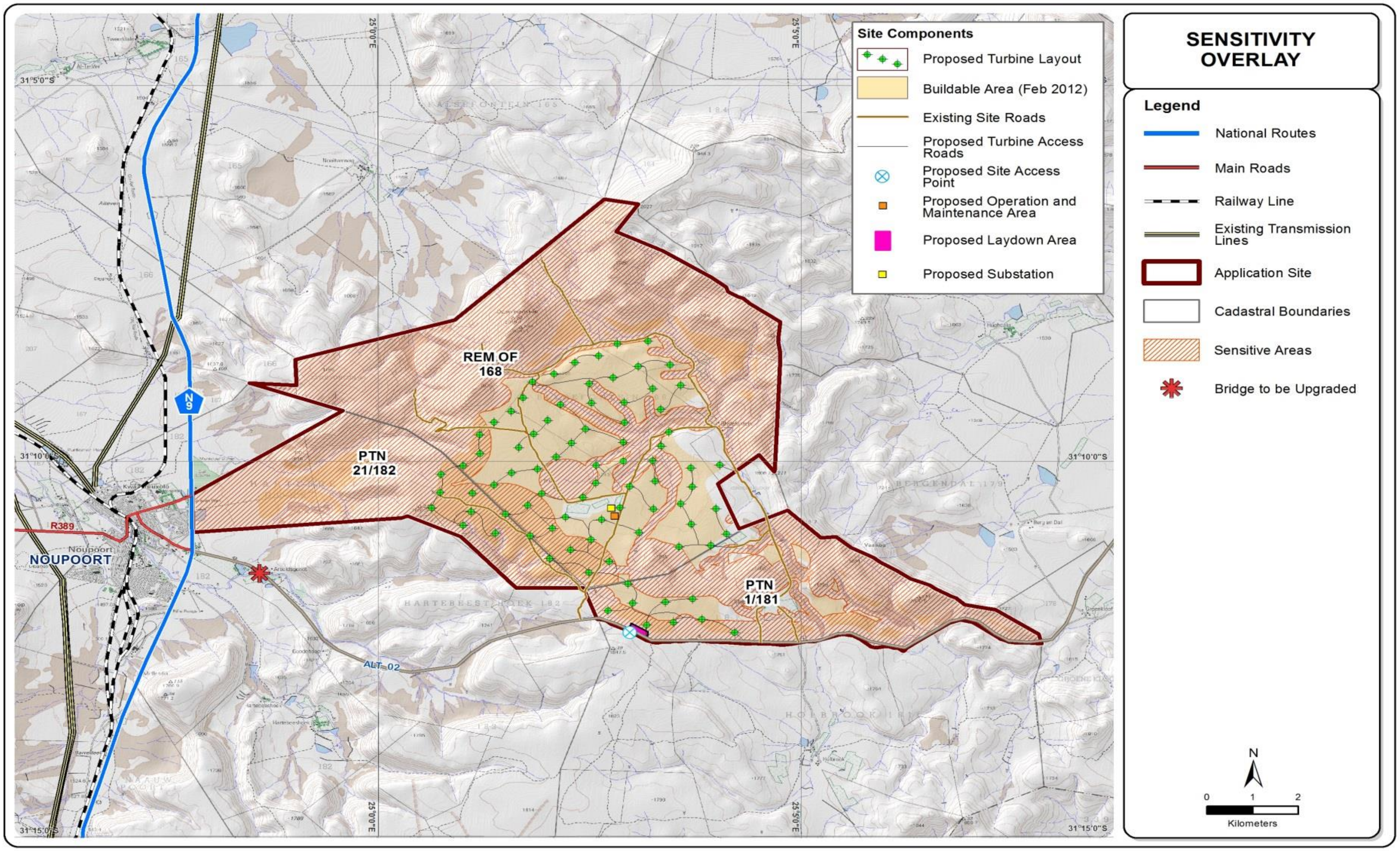


Figure 4: Layout Map including Sensitivity Overlay of the Noupoort Wind Farm from the FEIR dated 13th April 2012

1.4 Applicable Legislation, Development Strategies and Guidelines

The following legislation applies:

- Constitution of South Africa, 1996 (Act No. 108 of 1996);
- National Environmental Management Act, 1998 (Act No 107 of 1998) – NEMA;
- Environment Conservation Act, 1989 (Act No 73 of 1989);
- National Heritage Resources Act, 1999 (Act No 25 of 1999);
- National Water Act, 1998 (Act No 36 of 1998);
- Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009);
- National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004);
- National Forests Act, 1998 (Act No. 84 of 1998);
- Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983);
- Subdivision of Agricultural Land Act, 1970 (Act No. 70 of 1970, as amended);
- National Road Traffic Act, 1996 (Act No. 93 of 1996, as amended);
- Astronomy Geographic Advantage Act, 2007 (Act No. 21 of 2007);
- Occupational Health and Safety Act, 1993 (Act No. 85 of 1993);
- National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004);
- National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008);
- Development Facilitation Act, 1995 (Act No. 67 of 1995); and
- Northern Cape Planning and Development Act, 1998 (Act No. 7 of 1998).

Several regulations will be applicable to the construction phase of the project. These guidelines are mentioned in the EMPr tables. Also of significance in this EMPr are:

- World Bank IFC, EHS Guidelines; and
- Equator Principles

1.4.1 The Equator Principles

The environmental assessment process and subsequent compilation of this Final EMPr was undertaken in line with the Equator Principles (EPs).

1.5 Specific Conditions Pertaining to Authorisations

Conditions from the EA issued by the Department of Environmental Affairs (Ref: 12/12/20/2319), dated 29 October 2012, have been included within the Final EMPr. As such, all conditions pertaining to the construction, operation and decommissioning of the wind farm must be complied with.

A water use license has been applied for and may become applicable to the proposed project at a later stage. The following water uses have been applied for:

- Section 21 (a): Taking water from a water resource;
- Section 21 (c): Impeding or diverting the flow of water in a watercourse; and
- Section 21 (i): Altering the bed, banks course and characteristics of a watercourse.

Note that in terms of Section 21 (c) and (i), these water uses are being applied for as construction will take place within 500m of the wetlands on the wind farm site. However, no new construction is to take place directly or within 32m in a wetland or watercourse.

Specific conditions pertaining to regulatory processes, or Licensee / Holder of the Authorisation requirements, have not been included within the EMPr. These conditions are to be undertaken by the Licensee / Holder of the Authorisation prior to the appointment of a Contractor and commencement of construction related activities.

1.6 Layout of Environmental Management Programme

1.6.1 Introduction

This EMPr addresses both generic issues as well as site specific issues. The generic and issues specific EMPr's are each separated into different phases. Each phase has specific issues unique to that period of the development and operation of the wind farm as well as associated infrastructure. The impact is identified and given a brief description. The phases of the development are then identified as below:

- Pre-construction (Site Establishment);
- Construction (including associated rehabilitation of affected environment);
- Operation Phase; and
- Decommissioning.

This EMPr seeks to manage and keep to a minimum the negative impacts of a development and at the same time, enhance the positive and beneficial impacts.

The EMPr specifies mitigation measures for the following environmental aspects:

1.6.2 Pre-construction (Site establishment)

- Site preparation;
- Consultation;
- Site clearing; and
- Social and Environmental Management Systems.

1.6.3 Construction

- Construction Camp;
- Construction Traffic and Access;
- Environmental Education and Training;
- Soils and Geology;
- Erosion Control;
- Water Use and Quality;
- Surface and Groundwater;
- Waste Management;
- Flora;
- Fauna;
- Air Quality;
- Noise and Vibrations;
- Energy Use;
- Agricultural Potential;
- Employment;
- Occupational Health and Safety;
- Security;
- Social Environment;
- Heritage;
- Palaeontology;
- Community Engagement;
- Visual Impact;
- Bats; and
- Avi-fauna.

1.6.4 Operation

- Construction Site Decommissioning;
- Operation and Maintenance;
- Surface and Groundwater;
- Biodiversity;
- Waste Management;
- Health and Safety;
- Visual Impact;
- Bats;
- Avi-fauna;
- Social; and
- Noise.

1.6.5 Decommissioning Phase

- Ongoing Stakeholder involvement;
- Community health and safety;
- Waste Management;
- Surface and Groundwater;
- Biodiversity; and
- Air Pollution.

1.7 Objectives of an EMPr

The objectives of this EMPr are to:

- Identify a range of mitigation measures which could reduce and mitigate the potential impacts to minimal or insignificant levels;
- To identify measures that could optimize beneficial impacts;
- To create management structures that address the concerns and complaints of I&APs with regards to the development;
- To establish a method of monitoring and auditing environmental management practices during all phases of development;
- Ensure that the construction and operational phases of the project continues within the principles of Integrated Environmental Management and Environmental Management System (EMS) ISO 14001 Principles;

- Detail specific actions deemed necessary to assist in mitigating the environmental impact of the project;
- Ensure that the safety recommendations are complied with;
- Propose mechanisms for monitoring compliance with the EMPR and reporting thereon; and
- Specify time periods within which the measures contemplated in the Environmental Management Programme are implemented, where appropriate.

The EMPr seeks to highlight the following:

- Avoiding impacts by not performing certain actions;
- Minimising impacts by limiting aspects of an action;
- Rectifying impacts through rehabilitation, restoration, etc of the affected environment;
- Compensating for impacts by providing substitute resources or environments;
- Minimising impacts by optimising processes, structural elements and other design features;
- Provide ongoing monitoring and management of environmental impacts of a development and documenting of any digressions /good performances; and
- The EMPr is a legally binding document that all parties involved in the project must be made aware of.

1.7.1 Environmental monitoring

A monitoring programme will be implemented for the duration of the lifecycle of proposed development. This programme will include:

- Monthly audits according to the EMPr conditions will be conducted by the Environmental Control Officer; and
- Compilation of an audit report with a rating of the compliance with the EMPr. This report will be kept on site for record purposes and submitted if and when necessary to authorities.

The EO / SO shall keep a photographic record of any damage to areas outside the demarcated site area. The date, time of damage, type of damage and reason for the damage shall be recorded in full to ensure the responsible party is held liable. All claims for compensation emanating from damage should be directed to the EO / SO for appraisal. A register shall be kept of all complaints from the landowner or community (**Appendix E**. All complaints / claims shall be handled immediately to ensure timeous rectification / payment by the responsible party.

A hard copy of the Final EMPr must be kept on site during the lifecycle of the wind farm. The EMPr will be made binding on all contractors operating on the site and must be included within the Contractual Clauses. Those responsible for environmental damage must pay the repair costs both to the environment and human health and the preventative measures to reduce or prevent further pollution and/or environmental damage (the polluter pays principle).

1.8 Project Responsibilities

The roles and responsibilities of all the key role players involved in the EMPr are represented below.

1.8.1 The Project Company

The Project Company (South Africa Mainstream Renewable Power Noupoort (Pty) Ltd) will be responsible for the overall control of the project site in environmental terms during the pre-construction, construction, operation, decommissioning and rehabilitation phases of the proposed project. These responsibilities include the following:

- Appointing an independent ECO for the duration of the Contract and notify the DEA of their contact details;
- Being fully familiar with the EIA Report, EA conditions and the EMPr;
- Notifying the DEA of changes in the developments that result in significant environmental impacts;
- Notifying the DEA within 30 days of change of ownership;
- Notifying the DEA of any change of address of the owner/Project Company;
- The overall implementation of the EMPr;
- Ensuring compliance, by all parties, and the imposition of penalties for noncompliance
- Implementing corrective and preventive actions, where required;
- Preventing pollution and actions that will harm or may cause harm to the environment;
- Ensuring the activity does not commence within 30 days of the EA being issued;
- Notifying the DEA within 30 days that construction activity will commence;
- Notifying the DEA in writing within 24 hours if any condition in the EA cannot be or is not adhered to; and
- Notifying the DEA 14 days prior to commencement of the operational phase.

1.8.2 Construction Team

Several professionals will form part of the construction team. The most important from an environmental perspective are the Project Manager (PM), the Contractor Project Manager (CPM), the Main Contractor (MC), the Environmental Control Officer (ECO), the Environmental Officer (EO) and the Social Officer (SO).

The PM is responsible for the implementation of the EMPr on the site during the pre-construction and construction phases of the project.

The CPM is responsible for the establishment and management of contracts for the Main Contractor and the Sub-contractors.

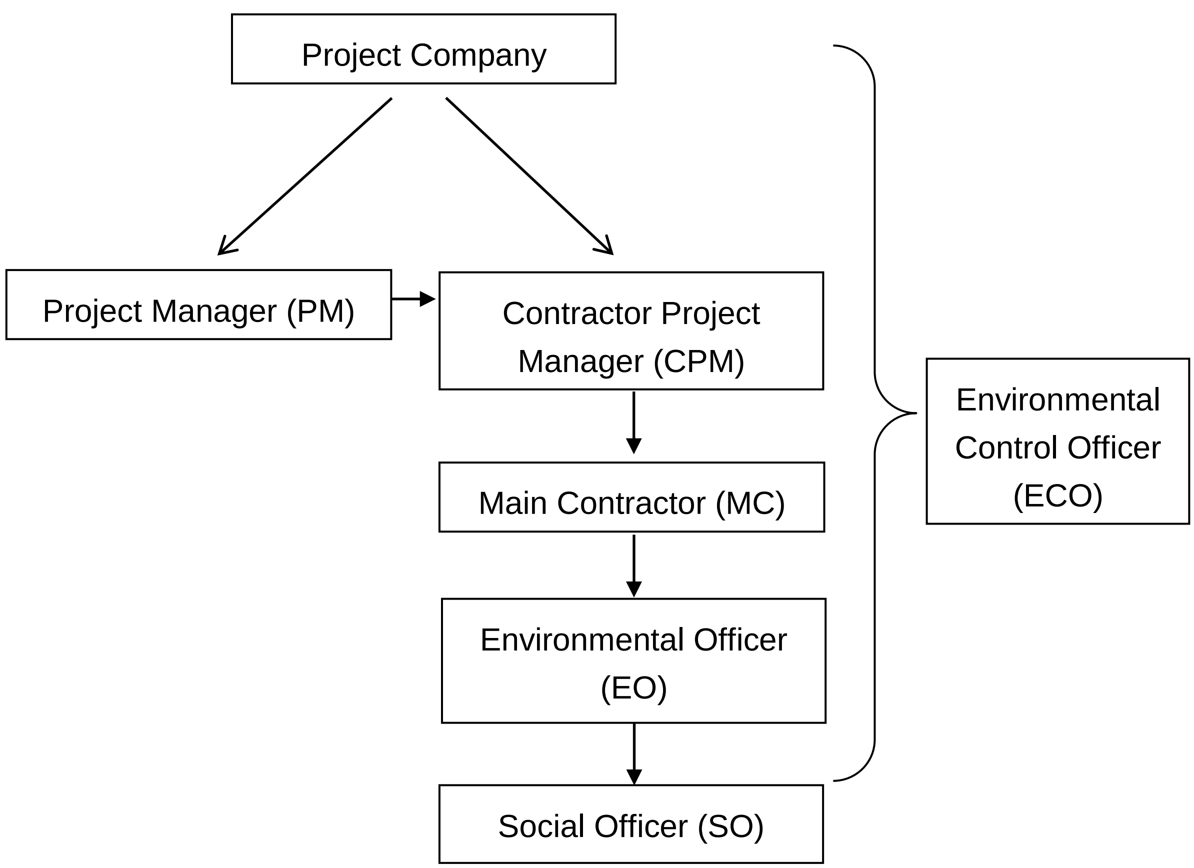
The MC is responsible for abiding by the mitigation measures of the EMPr which are implemented by the Project Manager during the construction phase. The MC is also responsible for the implementation of the EMPr during the operational and decommissioning phases of the project. However, it must be noted that the MC may change for each phase of the project. The EMPr will therefore be applicable to the relevant MC appointed for each phase of the project.

The ECO is responsible for monitoring the implementation of the EMPr during the design, pre-construction and construction phases of the project.

The EO is responsible for managing the daily onsite implementation of the EMPr.

The SO is responsible for managing the daily on-site implementation of the social aspects of the EMPr.

Basic Organogram:



1.8.3 Project Manager

The PM for the Noupoort Wind Farm will be SA Mainstream RP Construction (Pty) Ltd. The PM is responsible for overall construction management of the project as well as the implementation of the EMPr. The following tasks will fall within his / her responsibilities:

- Be aware of the findings and conclusions of the Environmental Impact Assessment and the conditions stated within the Environmental Authorisation;
- Be familiar with the recommendations and mitigation measures of this EMPr, and implement these measures;
- Monitor site activities on a daily basis for compliance;
- Conduct internal audits of the construction site against the EMPr;
- Confine the construction site to the demarcated area; and
- Rectify transgressions through the implementation of corrective action.

The Project Manager will assume ultimate responsibility. However, the abovementioned tasks can be delegated to the on-site manager for daily management.

1.8.4 Contractor Project Manager

The CPM for the Noupoort Wind Farm will be the Balance of Plant Contractor (BOPC). The CPM will undertake overall project contracts management between of the Main Contractor and the appointed Sub-Contractors. The following tasks will fall within his / her responsibilities:

- Responsible for establishing contractual agreements with the Main Contractor and Sub-Contractors;
- One of the key contracts will be for the supply, transport, erection and commissioning of the Wind Turbine Generators. This will be covered under the Turbine Supply Agreement (TSA).
- The TSA contractor will be bound by the EMPr and will need to report to the Project Company via the CPM; and
- Ensuring that Sub-Contractors adhere to the EMPr.

1.8.5 Main Contractor

The MC is responsible for the implementation and compliance with recommendations and conditions set out in the EMPr. This requires that the MC be familiar with the EIA report, EA conditions and the EMPR. This encompasses the following activities:

- Ensuring compliance with the EMPr at all times during construction;
- Ensuring that all subcontractors have a copy of and understand the contents of the EMPr, to ensure environmental best practice;
- Preventing pollution and avoid actions that will impact or harm the surrounding environment.
- Responsible for the construction activities to be carried out for the duration of the project (subcontractors and contract workers);
- Implementing corrective and preventive actions, where required;
- Maintain an environmental register which keeps a record of all incidents which occur on the site during construction. These incidents include:
    - Public involvement / complaints;
    - Health and safety incidents;
    - Hazardous materials stored on site; and
    - Non-compliance incidents.
- Development of specific method statements prior to commencment of environmentally sensitive constructions activities as identified in the EMP.

1.8.6 Environmental Control Officer

The ECO is responsible for the implementation of the EMPr during the construction phase and liaison between the Contractor and the Landowners. The ECO should have a minimum of two years of relevant experience as well as a relevant environmental degree or relevant tertiary qualification. The ECO is also to be an independent party. The ECO will liaise and report to the Contractor and authorities, thus the ECO should have effective communication and negotiating skills. The following tasks will fall within his / her responsibilities:

- Be aware of the findings and conclusions of the Environmental Impact Assessment and the conditions stated within the environmental authorisation;
- Work with the construction team to review relevant risk/ method statements from an environmental perspective;
- Be familiar with the recommendations and mitigation measures of this EMPr;
- Conduct monthly audits of the construction site according to the EMPr and EA. A monthly report will be produced detailing the findings of the audit highlighting any non-compliance issues. Positive compliance with the EMPr will also be noted;
- Educate the construction team about the management measures of the EMPr and EA;
- Regular liaison with the construction team and the project leader;
- Recommend corrective action for any environmental non-compliance incidents on the construction site;
- The affected parties shall always be kept informed about any changes to the construction programme should they be involved. If the ECO is not on site the Contractor should keep the affected parties informed. The contact numbers of the Contractor and the ECO shall be made available to the affected parties. This will ensure open channels of communication

and prompt response to queries and claims; and

- Liaising with the heritage specialist in the case of unearthing of artefacts and/ or graves.

The ECO is responsible for providing an independent evaluation of compliance with the EMPr and not for enforcement of conditions of the EMPr. The Project Company is responsible for enforcement of the conditions of the EMPr.

The Contractor and the EO are accountable to the ECO for non-compliance with the EMPr. The ECO provides feedback to the Project Company and I&APs, as required. Issues of noncompliance raised by the ECO must be taken up by the Project Company's Representative and resolved with the Contractor as per the conditions of his/her contract.

The ECO will remain employed for the full duration of the contract until all snag items have been resolved, rehabilitation measures have been completed, and the site is handed over to the Operator, thereby indicating the start of the operational phase.

1.8.7 Environmental Officer

The EO must be appointed by the Contractor and is responsible for managing the daily onsite implementation of the EMPr, and for the compilation of weekly environmental monitoring reports. In addition, the EO must act as liaison and advisor on all environmental and related issues, seek advice from the ECO when necessary, and ensure that any complaints received from I&APs are duly processed and addressed and that conflicts are resolved in an acceptable manner and timely manner. The EO shall be full time dedicated member of the Contractor's team and must be approved by the Project Company.

The following qualifications, qualities and experience are recommended for the individual appointed as the EO:

- A relevant environmental diploma or degree in natural sciences, as well as a minimum of three years' experience in construction site monitoring, excluding health and safety;
- A level-headed and firm person with above-average communication and negotiating skills. The ability to handle and address conflict management situations will be an advantage; and
- Relevant experience in environmental site management and EMPr compliance monitoring.

The EO's responsibilities include:

- Monitoring, on a daily basis, environmental specifications on site and compliance with the conditions of the EA, environmental legislation and EMPr;
- Keeping a register of compliance / non-compliance with the environmental specifications;
- Identifying and assessing previously unforeseen, actual or potential impacts on the

environment;

- Ensuring that a brief weekly environmental monitoring report is submitted to the ECO;
- Conducting site inspections during the defects liability period, and bringing any environmental concerns to the attention of the ECO and Contractor;
- Advising the Contractor on the rectification of any pollution, contamination or damage to the construction site, rights of way and adjacent land;
- Attending site meetings (scheduled and *ad hoc*);
- Presenting the environmental awareness training course to all staff, Contractors and Sub contractors, and monitoring the environmental awareness training for all new personnel on-site, as undertaken by the Contractor;
- Ensuring that a copy of the EA and the latest version of the EMPr are available on site at all times;
- Ensuring that the Contractor is made aware of all applicable changes to the EMPr that are approved by the DEA;
- Assisting the Contractor in drafting environmental method statements and/or the Environmental Policy where such knowledge/expertise is lacking;
- Undertaking daily environmental monitoring to ensure the Contractor's activities do not impact upon the receiving environment. Such monitoring shall include dust, noise and water monitoring; and
- Maintaining the following on site:
  - A weekly site diary.
  - A non-conformance register.
  - An I&AP communications register, and
  - A register of audits.

The EO will remain employed until all rehabilitation measures, as required for implementation due to construction damage, are completed and the site is handed over to the Operator.

1.8.8 Social Officer

The SO shall be employed by the Contractor and will be responsible for managing the daily on-site implementation of the social aspects of the EMPr. The SO shall liaise with landowners and relevant I&APs regarding construction activities for the duration of construction and will ensure that any discussions and complaints received from the public are addressed and that conflicts are resolved in an acceptable manner within 10 days.

The SO (s) shall be full time dedicated member(s) of the Contractor's team and must be accepted by the Project Company. The SO may also be the same person as the EO but will assume all the responsibilities of the dual role. The SO shall report to the Contractor's Project Manager, seeking advice from the ECO when necessary.

The following qualifications, qualities and experience are recommended for the individual appointed as the Contractor's SO:

- A person with communication and negotiating skills;
- Report writing skills; and
- Fluency in English, Afrikaans and any other local language as and where required.

The responsibilities and functions of the Construction SO will include:

- Implement and manage the daily social and communication aspects of the construction process according to the EMPr;
- Liaise and maintain good relations with I&APs;
- Monitor social aspects in terms of the specifications;
- Implement mitigation and corrective measures;
- Submit a monthly environmental report to the Contractor's Project Manager;
- Conduct site inspections during the defects notification period, and bring any social concerns to the attention of the Contractor;
- Attend site meetings (scheduled and ad hoc);
- Maintain a filing system meeting the project's quality management plan;
- Assist the Contractor in the drafting of social methods statements where such knowledge/expertise is lacking;
- Maintain the following on site:
    - A daily site diary;
    - A public complaints and communications register; and
    - A register of audits.
- Remain employed until the end of the end of construction.

1.8.9 Responsible Parties and Auditing Process

As described above, **Table 3** below provides a summary of the responsible parties and the auditing process to be carried out.

Table 3: Responsible Parties and Auditing Process

TITLE	PARTY	ROLE DURING CONSTRUCTION	ROLE DURING OPERATION
Project Company	South Africa Mainstream Renewable Power Noupoort (Pty) Ltd	Assume ultimate responsibility	Assume ultimate responsibility
Project Manager	SA Mainstream RP Construction (Pty) Ltd	Construction management	N/A

Contractor Project Manager	Balance of Plant Contractor	Project management	N/A
Main Contractor/s	There will be multiple contracts placed and managed by the Contractor's Project Manager for the construction phase. These will cover civil earthworks and concrete, structural mechanical and electrical / instrumentation (CI).	Main Contractor will undertake day to day construction activities covering aspects such as civil earthworks and concrete, structural mechanical and electrical / instrumentation (CI).	N/A
Environmental Officer	To be appointed by Main Contractors	Day to day environmental responsibility, point of contact for ECO	N/A
Environmental Control Officer	To be appointed by proponent	Monthly audits	Annual audits
Social Officer	To be appointed by Main Contractors	Day to day environmental responsibility, point of contact for landowners and I&APs's	Monthly Audits
Determining Authority	National Department of Environmental Affairs (DEA)	Conduct site visits when necessary.	Conduct site visits when necessary

The following are the environmental management responsibilities (**Table 4**) of the various parties during construction and operational phases. Unless otherwise stated, the EMPr will be adhered to as follows:

- The EO will be the responsible party for all daily compliance of this EMPr during the construction phase;
- The monitoring party will be the ECO;
- Method of record keeping will be monthly audits undertaken by the ECO;
- Audit Technique will be the review of records and documentation (including EMPr/EA) that will be kept on site by the EO and/ or site inspections; and
- The Project Company will bear ultimate responsibility.

Table 4: Environmental Management Responsibilities

ITEM	PROJECT COMPONENT AND ACTIVITY	RESPONSIBLE PARTY	MONITORING PARTY	AUDIT TECHNIQUE
1.1	**PRE-CONSTRUCTION (SITE ESTABLISHMENT)**			
1.1.1	Site preparation	PROJECT COMPANY, MC, EO, ECO	PROJECT COMPANY, ECO	SITE VISIT
1.1.2	Consultation	MC, SO	EO, ECO	SITE VISIT
1.1.3	Cumulative impacts	MC,	EO, ECO	SITE VISIT
1.1.4	Social and Environmental Management Systems	MC,	EO, ECO, SO	SITE VISIT
2.1	**CONSTRUCTION ACTIVITIES**			
2.1.1	Site Clearing	MC,	EO, ECO	SITE VISIT
2.1.2	Construction traffic and access	MC, EO	ECO	SITE VISIT
2.1.3	Construction Camp	MC, EO, ECO	ECO	SITE VISIT
2.1.4	Environmental Education and Training	PROJECT COMPANY, MC	PROJECT COMPANY	SITE VISIT
2.1.5	Soils and Geology	MC, EO	ECO	SITE VISIT
2.1.6	Erosion Control	EO	ECO	SITE VISIT
2.1.7	Water Use and Quality	EO	ECO	SITE VISIT
2.1.8	Surface and Groundwater	EO	ECO	RECORDS REVIEW
2.1.9	Waste Management	EO	ECO	SITE VISIT
2.1.10	Flora	EO	ECO	SITE VISIT
2.1.11	Fauna	EO	ECO	RECORDS REVIEW, SITE VISIT
2.1.12	Air Quality	EO	ECO	RECORDS REVIEW
2.1.13	Noise and Vibrations	EO	ECO	RECORDS REVIEW

ITEM	PROJECT COMPONENT AND ACTIVITY	RESPONSIBLE PARTY	MONITORING PARTY	AUDIT TECHNIQUE
2.1.14	Energy use	EO	ECO	RECORDS REVIEW
2.1.15	Climate Change	EO	ECO	RECORDS REVIEW
2.1.16	Agricultural Potential	EO	ECO	RECORDS REVIEW
2.1.17	Employment	PROJECT COMPANY, MC	ECO	RECORDS REVIEW
2.1.18	Occupational Health and Safety	MC, EO	SO	SITE VISIT
2.1.19	Health and Safety	MC, EO	SO	SITE VISIT
2.1.20	Security	MC, EO	ECO	SITE VISIT
2.1.21	Social Environment	PROJECT COMPANY, MC, SO	ECO	RECORDS REVIEW, SITE VISIT
2.1.22	Community Engagement	SO	ECO	SITE VISIT
2.1.23	Visual Impact	EO	ECO	SITE VISIT
2.1.24	Bat Impact	PROJECT COMPANY, MC, EO	ECO	SITE VISIT
2.1.25	Avi-fauna Impact	PROJECT COMPANY, MC, EO	ECO	SITE VISIT
3.1	**OPERATION ACTIVITIES**			
3.1.1	Construction Site Decommissioning	PROJECT COMPANY	ECO	RECORDS REVIEW
3.1.2	Operation and Maintenance	PROJECT COMPANY	ECO	RECORDS REVIEW
3.1.3	Surface and Groundwater	MC	ECO	RECORDS REVIEW
3.1.6	Pollution Control	PROJECT COMPANY, MC	ECO	RECORDS REVIEW
3.1.7	Biodiversity	EO	ECO	RECORDS REVIEW
3.1.8	Waste Management	EO	ECO	RECORDS REVIEW

ITEM	PROJECT COMPONENT AND ACTIVITY	RESPONSIBLE PARTY	MONITORING PARTY	AUDIT TECHNIQUE
3.1.9	Health and Safety	PROJECT COMPANY, EO	ECO	RECORDS REVIEW
3.1.10	Visual Impact	EO	ECO	RECORDS REVIEW
3.1.11	Bat Impact	EO	ECO	RECORDS REVIEW AND SITE VISIT
3.1.12	Avi-fauna Impact	EO	ECO	RECORDS REVIEW AND SITE VISIT
4.1	**DECOMMISSIONING ACTIVITIES OF PROPOSED DEVELOPMENT**			
4.1.1	Ongoing Stakeholder involvement	PROJECT COMPANY, SO	PROJECT COMPANY,	SITE VISIT
4.1.2	Community health and safety	PROJECT COMPANY, SO	PROJECT COMPANY,	RECORDS REVIEW
4.1.3	Waste management	PROJECT COMPANY, EO	PROJECT COMPANY,	RECORDS REVIEW AND SITE VISIT
4.1.4	Surface and groundwater	PROJECT COMPANY, EO	PROJECT COMPANY,	RECORDS REVIEW AND SITE VISIT
4.1.5	Biodiversity	PROJECT COMPANY, EO	PROJECT COMPANY,	RECORDS REVIEW AND SITE VISIT
4.1.6	Air quality	PROJECT COMPANY, EO	PROJECT COMPANY,	RECORDS REVIEW AND SITE VISIT

1.8.10 Environmental Audits

Table 5 below provides an outline of the generic process involved in the auditing process. It briefly describes the activities of the process initially beginning with defining the objectives and scope of the auditing process as well as the responsibilities of the various parties. The procedure for the auditing process is explained through to the production of audit findings and the compliance (or non-compliance) of the audit findings.

Table 5: Example of Procedure for Conducting Audits

Objective	To ensure that formal audits of the EMPr are scheduled and performed so as to verify compliance with the requirements of the EMPr.
Scope	This procedure describes the sequence of events required to perform a compliance audit and the verification of implemented corrective action.
Responsibilities	The ECO or a person authorised and appointed by him, is responsible for the maintenance of the Environmental Audit System The ECO is responsible for the scheduling and execution of the audit, as well as the verification of the implementation of corrective action. At his/her discretion, this authority may be delegated to responsible company personnel or to an independent Environmental Auditing Authority to perform the audit on his/her behalf. Auditors shall have no direct responsibility in the area/ system being audited. They will be trained in techniques for auditing environmental management systems. The head of department (HOD)/ supervisor for an area/system to be audited (or a responsible person nominated by him/ her) will assist the audit team in the execution of the audit. The HOD will also be responsible for timely corrective actions based on the findings of the audit.
Planning the audit	The ECO or his authorised delegate, shall plan the audit of a particular environmental area or system as follows: ▪ He shall inform, in writing, the contractor to be audited of the intention to conduct an audit at least two weeks prior to the audit. This notification should include the audit objective, scope and duration and any assistance

	required from the contractor. ▪ On completion of the audit, an audit findings report shall be prepared and submitted to Project Company, project manager and construction team . ▪ Corrective actions shall be implemented, within four weeks after the audit, where possible.
Audit Check List	Auditing will be performed by collecting evidence for verification through interviews, relevant documentation and observation of activities and conditions. Instances of non-conformity to EMPr criteria should be recorded. An environmental audit checklist can be used as a guide to address all relevant issues.
Audit Compliance	See below.
Audit Findings and Reporting of non-compliances	The audit team shall review all evidence of their audit findings to decide on non-compliance. Audit findings of non-compliance must be documented and supported by evidence in the Audit Findings Report. The non-compliance findings will be communicated to the Project Manager and his representatives during an audit feedback meeting.

2 ENVIRONMENTAL DOCUMENTATION, REPORTING AND COMPLIANCE

2.1 Documentation

The Contractor must ensure the following documentation is kept on the project site for the full duration of the contract:

- Final Environmental Management Programme approved by the DEA;
- EA issued by the DEA;
- Environmental Policy of the Contractor;
- Environmental method statements compiled by the Contractor;
- Weekly environmental monitoring reports;

- Minutes and record of attendance of all environmental meetings;
- Environmental incident book;
- Communications register;
- Register of audits;
- Non-conformance reports; and
- Waste manifests.

2.1.1 Weekly Environmental Monitoring Report

The EO will be required to provide the Main Contractor with a brief weekly environmental monitoring report covering the onsite events which occurred during the past week. This will highlight key performance areas and provide feedback on corrective and preventive actions taken. The EO will have the weekly reports submitted by the Contractor's Manager prior to submission to the Project Company for monthly reporting.

2.1.2 Site Meetings

Weekly site meetings are undertaken which include environmental matters. This meeting shall be chaired by a Senior Site Representative with the Project Company, Contractor(s), the EO ('s), and SO ('s) in attendance. Where practical or necessary, the ECO will need to attend if possible.

2.1.3 Method Statements

It is a statutory requirement to ensure the wellbeing of employees and of the environment. Therefore, the Contractor shall submit a Method Statement to the Project Company and the ECO for approval prior to the commencement of construction works.

A Method Statement is a document detailing how a particular process will be carried out. It should detail the possible dangers/risks associated with the particular part of the project and the methods of control to be established and to show how the work will be managed in a safe and environmentally responsible manner. The method statement shall also include the following information, where applicable:

- The type of construction activity;
- Timing and location of the activity;
- Construction procedures;
- Materials and equipment to be used;
- Transportation of the equipment to and from site;

- How the equipment/material will be moved while on site;
- Location and extent of construction site office and storage areas;
- Identification of impacts that might result from the construction activity;
- Population impacts;
- Community/institutional arrangements;
- Conflicts between local residents and newcomers;
- Individual and family level impacts;
- Community infrastructure needs;
- Intrusion impacts;
- Methodology and/or specifications for impact prevention or containment and for environmental monitoring;
- Emergency/disaster incident and reaction procedures (required to be demonstrated); and
- Rehabilitation procedures and continued maintenance of the impacted environment.

The Contractor will be accountable for all actions taken in non-compliance of the approved method statements. The Contractor shall keep all the method statements and subsequent revisions on file, copies of which must be distributed to all relevant personnel for implementation.
The Contractor will be required to submit, as a minimum, the relevant method statements as requested by the ECO which are to be compliant with the conditions of the EMPr for review prior to the start of that specific activity.

2.1.4 Communications Register

All complaints or communications that are received from I&APs or any other stakeholder must be recorded in a communications register. These complaints and communications will be brought to the attention of the Project Company., whereupon it will be investigated and a response to the Complainant, I&APs or stakeholder will be given within 10 days. The communications register shall include the following information:

- Record the time and date of the complaint/communication;
- A detailed description of the complaint/communication;
- Action and resources used to correct the complaint;
- Photographic evidence of the complaint (where possible);
- A written response to the complainant indicating rectification of the complaint; and
- Information regarding the relevant authority that was contacted or notified in writing where applicable (person, time and date).

The relevant authorities include:

- Department of Water Affairs (e.g. for any incidents involving the contamination of water resources);
- DEA (e.g. for any significant incident of pollution of the soil and air);

- Department of Agriculture, Forestry and Fisheries (e.g. uses of appropriate herbicides for eradication of alien invasive species, and permits for trees of special concern);
- Department of Health (e.g. for incidents such as contamination of water resources, accidental spill of hazardous substances);
- Department of Transport (e.g. for the diversion of traffic due to construction activities); and
- Department of Labour (e.g. for labour disputes).

2.1.5 Photographic Record

The EO and SO will be required to compile a photographic record (dated) of all activities on site prior to construction related activities starting, during the construction process and on completion of construction related works. This photographic record will include:

- A pre-construction site record;
- Monthly environmental audit reports;
- Weekly environmental monitoring reports;
- Corrective action;
- Progress of environmental works; and
- Non-conformance reports.

2.1.6 Waste Manifests

The Contractor shall ensure that all solid (including any hazardous) waste removed from site is disposed of at a registered landfill site or nearby waste transfer station with capacity to accept the project generated waste. The waste manifest shall be kept on record for auditing purposes.

2.1.7 Good Housekeeping

The Contractor is to practice good housekeeping throughout the construction phase. This should eliminate disputes about responsibility, facilitate efficient and timeous running of the project. Over and above practicing accepted construction methods in accordance with SANS 10120, this should include measures to preserve the environment inside the work area. Records of such actions taken to ensure the maintenance and management of housekeeping must be recorded.

The Contractor shall record and report upon environmental management measures undertaken to mitigate assessed impacts upon the environment.

2.1.8 Management And Control

The Contractor is to implement environmental management in a reasonable manner and should such management not prove effective, shall implement measures to the satisfaction of the Project Company. Appropriate measures shall include:

- Appointment of necessary resources to monitor and manage environmental requirements;
- Implement aspect-specific method statements to deal with emergency situations;
- Provision of adequate emergency response equipment to mitigate and manage an incident or emergency; and
- Provision of specific training related to implementation of environmental management requirements.

2.1.9 Recording And Reporting

The Contractor shall maintain detailed records of parameters monitored. These detailed records shall demonstrate the effectiveness of the management actions implemented to mitigate potential impacts. The Contractor shall submit a monthly database/report of management works implemented to the Project Company, as part of the Contractors monthly report.

2.1.10 Monitoring

The Contractor shall submit an Environmental Monitoring Method Statement which details the scope, nature, process, schedule and templates for environmental monitoring. The monitoring results shall be used to determine the effectiveness of the management programme. All complaints, compliments or other comments relating to environmental management parameters are to be recorded in the site issues register of the Contractor for inclusion in the project issues register held by the Project Company.

Monitoring results and the associated required management and mitigation actions for the coming monitoring period are to be presented in the monitoring section of the Contractors monthly report. The weekly reports are to detail observations and information relating to requested management actions and their effectiveness.

The Contractor shall monitor and maintain the following on an ongoing basis:

- Re-growth of alien invasive vegetation;
- Validity of the pest control officer certificate;
- Fire break requirements associated to construction related activities;

- Stormwater systems;
- Topsoil and backfill volumes;
- Access road condition;
- Dust generated from stockpiles;
- Noise;
- Water quality;
- Erosion prevention;
- Landscaping requirements for rehabilitation;
- Spoil management;

The Contractor shall submit a monthly database of inter alia the following works to the Project Company. This data base is to include as a minimum:

- Extent of alien invasive clearing operations;
- Volumes of herbicide used on the project;
- Stockpile volumes of chipped material, topsoil, fertile soil and subsoil;
- Volume of recyclable waste removed from site;
- Water volumes recycled and used for dust suppression; and
- Maintenance of chemical toilets.

All complaints, compliments or other comments relating to construction related works are to be recorded by the Contractor in the communications register of the receiving party for inclusion in the project issues register. Site clearance monitoring results and the associated required management and mitigation actions for the coming monitoring period are to be presented in the monitoring section of the Contractors monthly report. The weekly report is to detail observations and information relating to requested management actions and their effectiveness. Compliance with the EMPr

The Contractor/s is/are deemed not to have complied with the EMPr if:

- Within the boundaries of the site, site extensions and access roads there is evidence of contravention of clauses;
- If environmental damage ensues due to negligence;
- The contractor fails to comply with corrective or other instructions issued by the ECO or Authorities within a specified time; and
- The Contractor fails to respond adequately to complaints from the public.

The Project Company is deemed not to have complied with the EMPr if:

- Within the boundaries of the site there is evidence of contravention of clauses;
- If environmental damage ensues due to negligence; and
- They fail to respond adequately to complaints from the public.

2.1.11 Non-Conformance Report

A Non-Conformance Report (NCR) will be issued to the Contractor as a final step towards rectifying a failure in complying with a requirement of the EMPr. This will be issued to the Contractor in writing. Preceding the issuing of the NCR, the Contractor will be presented with an opportunity to rectify the outstanding issue in a timely manner.

Preceding requirements to the submitting of the NCR will entail an issue that has been highlighted to the Contractor in the audits for corrective action. Should this issue not be corrected or completed to the satisfaction of the Project Company and ECO, the issue is escalated to an NCR.

Should the ECO assess an incident / issue and find it to be significant (e.g. non-repairable damage upon the environment), it will be reported to the DEA and immediately escalated to the level of an NCR. This will be done in consultation with the Project Company. The following information should be recorded in the NCR:

- Details of non-conformance;
- Any plant or equipment involved;
- Any chemicals or hazardous substances involved;
- Work procedures not followed;
- Any other physical aspects;
- Nature of the risk;
- Actions agreed to by all parties following consultation that should adequately address the identified non-conformance. This may take the form of specific control measures and should take the hierarchy of controls into account. This must accompany the NCR for filing purposes;
- The agreed timeframe by which the Contractor should have implemented the actions documented in the NCR; and
- The ECO should verify that the agreed actions have taken place on or soon after the agreed completion date. Where the actions are complete, the ECO and Contractor should sign the Close Out portion of the Non-Conformance Form and file it with the contract documentation.

2.1.12 Environmental Emergency Response

The Contractor's environmental emergency procedures must ensure that there will be an appropriate response to unexpected or accidental actions or incidents that could cause environmental impacts. Such incidents may include:

- Accidental discharges to water (i.e. into a water resource) and land;
- Accidental spillage of hazardous substances (typically oil, petrol, and diesel);
- Accidental toxic emissions into the air;
- Specific environmental and ecosystem effects from accidental releases or incidents;
- The Environmental Emergency Response Plan is separate to the Health and Safety Plan as it is aimed at responding to environmental incidents and must ensure and include the following:
  - Construction employees shall be adequately trained in terms of incidents and emergency situations;
  - Details of the organisation (manpower) and responsibilities, accountability and liability of personnel;
  - A list of key personnel and contact numbers;
  - Details of emergency services (e.g. the fire department, spill cleanup services) shall be listed;
  - Internal and external communication plans, including prescribed reporting procedures;
  - Actions to be taken in the event of different types of emergencies;
  - Incident recording, progress reporting and remediation measures to be implemented; and
  - Information on hazardous materials, including the potential impact associated with each, and measures to be taken in the event of accidental release.

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

2.1.13 Penalties for non-compliance

Application of a penalty clause to the contractor will apply for incidents of non-compliance. The penalty imposed will be per incident and will be deducted from the contractor’s monthly payment certificate. Unless stated otherwise in the project specification, the penalties imposed per incident or violation will be pre-determined and agreed upon between the Contractor and the ECO. These will vary in amount based upon the severity and/or regularity of the incidence occurring.

The ECO in consultation and with the approval of the Senior Site Supervisor shall issue spot fines if the Contractor infringes specifications of the EMPr and EA. The Contractor shall be advised in writing of the nature of the infringement and the amount of the spot fine. The Contractor shall be liable for the fine and it is his responsibility to recover the fine from the relevant employee. The Contractor (through the Environmental Officer) shall also take the necessary steps (e.g. training) to prevent a recurrence of the infringement. The Contractor is also advised that the imposition of spot fines does not replace any legal proceedings from the authorities, landowners and/or members of the public that may institute against the Contractor. Spot fines for minor offences shall be agreed upon with the Project Company, depending upon the severity of the infringement. Any rectification costs incurred will be passed to the infringing party(ies). The decision on how much to impose will be made by the ECO and will be final. In addition to the spot fine, the Contractor shall be required to make good any damage caused as a result of the infringement at his own expense. A preliminary list of infringements for which spot fines will be imposed is as follows:

- Using areas outside the working areas without permission/accessing “no-go areas”;
- Clearing and/or levelling area outside of the working areas;
- Littering of the site and surrounds;
- Burying waste on site and surrounds;
- The undertaking of informal ablutions
- Making fires on site;
- Exceeding the speed limit of 40km/h;
- Driving and / or parking on rehabilitated areas.
- Spillage onto the ground or water bodies of oil, diesel, or any other potential pollutants;
- Picking/damaging plant material, especially that from the residual areas of natural bush on the site;
- Damaging/killing wild or domestic animals/birds;
- Discharging effluent and/or stormwater onto the ground or into surface water; and
- Repeated contravention of the specification or failure to comply with instruction.

In this context the ECO shall retain records of all fines issued. Monies for the spot fines will be deducted from the Contractors monthly certificate. It is recommended that these monies be collected and donated to a suitable charity or cause.

The Senior Site Supervisor, on recommendation from the ECO, may also order the Contractor to suspend part or all the works if the Contractor repeatedly causes damage to the environment by not adhering to the EMPr (i.e. more than 3 cases of infringements). The suspension will be enforced until such time as the offending actions, procedure or equipment is corrected. No extension of time will be granted for such delays and all costs will be borne by the Contractor.

2.1.14 Training and awareness

The Main Contractor is to take responsibility for the management of their staff and subcontractors on the project site during the construction phase and supervise them closely at all times. The onus is on the Contractor to make sure that all their staff and subcontractors fully comprehend the contents of the EMPr. The Contractor shall organise environmental awareness training programmes, which should, be targeted at the two levels of employment: management and labour.

2.1.14.1 Training of construction workers

The Construction Workers must receive basic training in environmental awareness, including the storage and handling of hazardous substances, minimisation of disturbance to sensitive areas, management of waste, and prevention of water pollution. They must be informed of how to recognise historical / archaeological artefacts that may be uncovered. They must also be appraised of the EMPr's requirements. Environmental awareness training programmes need to be formulated for these levels and must comprise:

- A record of all names, positions and duties of staff to be trained;
- A framework for the training programmes;
- A summarised version of the training course(s); and
- An agenda for the delivery of the training courses.

Such programmes will set out the training requirements, which need to be conducted prior to any construction works occurring and will include:

- Acceptable behaviour with regard to flora and fauna;
- Management and minimising of waste, including waste separation;
- Maintenance of equipment to prevent the accidental discharge or spill of fuel, oil, lubricants, cement, mortar and other chemicals;
- Responsible handling of chemicals and spills;
- Environmental emergency procedures and incident reporting; and
- General code of conduct towards I&APs.

The ECO may be requested to provide additional training (in a first language) on-site regarding environmental aspects that are unclear to the construction personnel. A translator may be required and requested to assist in this additional training. The cost for the translator will be borne by the Contractor.

2.1.14.2 Contractor performance

The Main Contractor must ensure that the conditions of the EMPr are adhered to. Should the Main Contractor require clarity on any aspect of the EMPr, the Main Contractor must contact the Environmental Control Officer for advice.

3 MITIGATION GUIDELINES

3.1 Introduction

Mitigation guidelines are addressed through four phases namely Pre-construction (Site Establishment) Phase; Construction Phase (and associated rehabilitation of affected environment); Operational Phase (Post-Construction) as well as Decommissioning Phase. Each phase has specific issues unique to that period of the development and operation of the wind farm and the associated infrastructure. The impact is identified and given a brief description. The four phases of the development are then identified as below.

3.2 Pre-construction (Site Establishment)

Requirements for the pre-construction phase

- Proper and continuous liaison between the SO, ECO, the Contractor and Landowners to ensure all parties are appropriately informed at all times;
- The Contractor must adhere to all conditions of the contract including the Environmental Management Programme;
- Adequate planning of the construction programme to allow for disruptions due to rain and very wet conditions;
- Where existing private roads are in a bad state of repair, such roads' condition shall be documented before they are used for construction purposes. This will allow for easy assessment of any damage to the roads which may result from the construction process. If necessary some repairs should be done to prevent damage to equipment. All roads no matter what the condition need to be documented prior to construction;
- Proper documentation and record keeping of all complaints and actions taken;
- Appointment of an Environmental Control Officer to implement this EMPr;
- Regular site inspections by the ECO and good control over the construction process throughout the construction period;
- ECO Environmental Audits to be carried out during and upon completion of construction;
- A formal communications protocol should be set up during the construction phase. The aim of the protocol should be to ensure that effective communication on key issues that may arise during this phase be maintained between key parties such as the ECO, project manager and contractor. The protocol should also ensure that concerns / issues raised by I&APs are formally recorded and considered and where necessary acted upon. If necessary, a forum for communicating with key stakeholders on a regular basis may need to be set up. This could be done through an Environmental Monitoring Committee that would meet on a regular basis. The communications protocol should be maintained

throughout the construction phase; and

- The environmental baseline specialist findings, pre-construction walk-throughs and any additional information available must be consulted prior to construction by the ECO and EO to inform the environmental reference condition for rehabilitation post-construction.

3.3 Pre-Construction Phase

3.3.1 Site preparation

Table 6: Site preparation

IMPACT	**SITE PREPARATION** **This section deals with the preparation of the site and actions that need to be implemented before construction commences**	**RESPONSIBILITY**
PHASE	**SITE ESTABLISHMENT**	**MC / EO / ECO**
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION / METHOD STATEMENT	**Appoint construction team and suitable manager** 1. Appoint an Environmental Control Officer and Environmental Liaison Officer. The EO is from the contractor's side while the ECO is from the client's side. **Site demarcation and compliance** 1. Before construction begins, all areas to be developed must be clearly demarcated with fencing or orange construction barrier where applicable. 2. All Construction Camps are to be fenced off in such a manner that unlawful entry is prevented and access is controlled. Signage shall be erected at all access points in compliance with all applicable occupational health and safety requirements. All access points to the Construction Camp should be controlled by a guard or otherwise monitored, to prevent unlawful access. 3. The contractor and ECO must ensure compliance with conditions described in the EA. 4. Records of compliance/ non-compliance with the conditions of the authorisation	

	must be kept and be available on request. 5. Records of all environmental incidents must be maintained and a copy of these records be made available to provincial department on request throughout the project execution. **Construction Camp** 1. Site establishment shall take place in an orderly manner and all required amenities shall be installed at camp sites before the main workforce move onto site. 2. All construction equipment must be stored within this construction camp. 3. All associated oil changes etc (no servicing) must take place within this camp over a sealed surface such as a concrete slab. 4. An area for the storage of hazardous materials must be established that conforms to the relevant safety requirements and that provides for spillage prevention and containment 5. All Construction Camps shall be provided with portable fire extinguishing equipment, in accordance with all relevant legislation and must be readily accessible. 6. The Contractor must provide sufficient ablution facilities, in the form of portable / VIP toilets, at the Construction Camps, and shall conform to all relevant health and safety standards and codes. No pit latrines, French drain systems or soak away systems shall be allowed and toilets may not be situated within 100 meters of any surface water body or 1:100 year flood line. A sufficient number of toilets shall be provided to accommodate the number of personnel working in the area. 7. The Contractor shall inform all site staff to make use of supplied ablution facilities and under no circumstances shall indiscriminate sanitary activities be allowed. 8. No unauthorised fires will be allowed and the Contractor must make alternative arrangements for heating. Fires will only be permitted in the pre-allocated fire area. LP Gas may be used, provided that all required safety measures are in place. The	

	Contractor shall take specific measures to prevent the spread of veld fires, caused by activities at the campsites. These measures may include appropriate instruction of employees about fire risks and the construction of firebreaks around the site perimeter. **Labour** 9. Where possible all unskilled labourers for pre-site construction should be drawn from the local market and use should be made of local semiskilled and skilled personnel. All labour needs to comply with the Implementation Agreement (IA) as entered into between the Department of Energy (DoE) and Project Company. **Training of site staff** 10. Environmental awareness training for construction staff, concerning the prevention of accidental spillage of hazardous chemicals and oil; pollution of water resources (both surface and groundwater), air pollution and litter control and identification of archaeological artefacts. 11. Project manager shall ensure that the training and capabilities of the Contractor's site staff are adequate to carry out the designated tasks. 12. Staff operating equipment (such as loaders, etc.) shall be adequately trained and sensitised to any potential hazards associated with their tasks. 13. No operator shall be permitted to operate critical items of mechanical equipment without having been trained by the Contractor and certified competent by the Project Manager. 14. Staff should be educated as to the need to refrain from indiscriminate waste disposal and/or pollution of local soil and water resources and receive the necessary safety training. 15. Staff must be trained in the hazards and required precautionary measures for dealing with these substances	

	16. Spillage packs must be available at construction areas.	

3.3.2 Consultation

Table 7: Consultation

IMPACT	**CONSULTATION** **This section deals with the public consultation of the site and actions that need to be implemented before construction commences**	**RESPONSIBILITY**
PHASE	**PRE-CONSTRUCTION**	**MC / SO**
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION / METHOD STATEMENT	**Consultation** 1. Provide a mechanism through which information could be exchanged between the project proponent and stakeholders. 2. Identify relevant stakeholders and engage them at applicable stages of the EIA process. 3. Inform the public about the proposed construction process. 4. Surrounding communities must be kept informed, through the identified and agreed consultation channels, of the commencement of construction. 5. Solicit views and concerns from the public and allow them to suggest mitigations and enhancement measures 6. Determine stakeholder satisfaction levels.	

3.3.3 Site Clearing

Table 8: Site Clearing

IMPACT	**SITE CLEARING** **This section deals with site clearing and actions that need to be implemented before construction commences**	**RESPONSIBILITY**
PHASE	**PRE-CONSTRUCTION**	**MC**
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION / METHOD STATEMENT	**Site clearing** 1. Site clearing must take place in a phased manner, as and when required. 2. Areas which are not to be constructed on within two months must not be cleared to reduce erosion risks. 3. The area to be cleared must be clearly demarcated and this footprint strictly maintained. 4. Spoil that is removed from the site must be removed to an approved spoil site or a licensed landfill site. 5. The necessary silt fences and erosion control measures must be implemented in areas where these risks are more prevalent.	

3.3.4 Social and Environmental Management Systems

Table 9: Social and Environmental Management Systems

IMPACT	**SOCIAL AND ENVIRONMENTAL MANAGEMENT SYSTEMS** **This section deals with the Social and Environmental Management Systems and actions that need to be implemented before construction commences**	**RESPONSIBILITY**
PHASE	**SITE ESTABLISHMENT**	**MC / SO**
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION / METHOD STATEMENT	**Social** 1. Performance Standard One underscores the importance of managing social and environmental performance throughout the life of a project. 2. An effective social and environmental management system is a dynamic, continuous process initiated by management and involving communication between the client, its workers and the local communities directly affected by the project. 3. The client will establish and maintain a Social and Environmental Management System, appropriate to the nature and scale of the project and commensurate to the level of social and environmental risks and impacts. The management system will incorporate the following elements: o Social and Environmental Assessment o Management program o Organizational capacity o Training o Community Engagement o Monitoring and Reporting	

3.4 Construction Phase

3.4.1 Construction Camp

Table 10: Construction Camp

IMPACT	**CONSTRUCTION CAMP** **This section deals with construction camp (equipment and batching camp) and actions that need to be implemented during construction**	**RESPONSIBILITY**
PHASE	**CONSTRUCTION**	**MC / EO / ECO**
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION / METHOD STATEMENT	**Site of construction camp** 1. The size of the construction camp must be minimized. 2. Adequate parking must be provided for site staff and visitors. The Contractor must attend to drainage of the camp site to avoid standing water and / or sheet erosion. 3. Suitable control measures over the Contractor's yard, plant and material storage to mitigate any visual impact of the construction activity must be implemented. **Storage of materials (including hazardous materials)** 1. Choice of location for storage areas must take into account prevailing winds, distances to water bodies, general onsite topography and water erosion potential of the soil. Impervious surfaces must be provided where necessary.	

	2. Storage areas must be designated, demarcated and fenced if necessary. 3. Storage areas should be secure so as to minimize the risk of crime. They should also be safe from access by unauthorised persons i.e. children / animals etc. 4. Fire prevention facilities must be present at all storage facilities. 5. Proper storage facilities for the storage of oils, paints, grease, fuels, chemicals and any hazardous materials to be used must be provided to prevent the migration of spillage into the ground and groundwater regime around the temporary storage area(s). These pollution prevention measures for storage must include a bund wall high enough to contain at least 110% of any stored volume, and this must be sited away from drainage lines in a site with the approval of the Project Manager. The bund wall must be high enough to contain 110% of the total volume of the stored hazardous material with an additional allocation for potential stormwater events. 6. All fuel storage areas must be roofed to avoid creation of dirty stormwater 7. These storage facilities (including any tanks) must be on an impermeable surface that is protected from the ingress of storm water from surrounding areas and that will not infiltrate into the ground in order to ensure that accidental spillage does not pollute local soil or water resources. 8. Material Safety Data Sheets (MSDSs) shall be readily available on site for all chemicals to be used on site. Where possible the available, MSDS's must additionally include information on ecological impacts and measures to minimise negative environmental impacts during accidental releases or escapes. 9. Storage areas containing chemical substances / materials must be clearly sign posted. 10. Staff dealing with these materials / substances must be aware of their	

	potential impacts and follow the appropriate safety measures. 11. An approved waste disposal contractor must be employed to remove and recycle waste oil, if practical. The contractor must ensure that its staff is made aware of the health risks associated with any hazardous substances used and has been provided with the appropriate protective clothing/equipment in case of spillages or accidents and have received the necessary training. 12. All excess cement and concrete mixes are to be contained on the construction site prior to disposal off site. 13. All major spills as specified in the contractor emergency response procedure of any materials, chemicals, fuels or other potentially hazardous or pollutant substances must be cleaned immediately and the cause of the spill investigated. Preventative measures must be identified and submitted to the MC and ECO for information. Emergency response procedures to be followed and implemented. **Drainage of construction camp** 1. Surface drainage measures must be established in the Construction Camps so as to prevent ▪ Ponding of water; ▪ Erosion as a result of accelerated runoff; and, ▪ Uncontrolled discharge of polluted runoff.	

3.4.2 Construction traffic and access

Table 11: Construction Traffic and Access

IMPACT	**CONSTRUCTION TRAFFIC AND ACCESS** **This section deals with construction traffic and access and actions that need to be implemented during construction**	**RESPONSIBILITY**
PHASE	**CONSTRUCTION**	**MC / EO**
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION / METHOD STATEMENT	**Construction traffic** 1. Construction routes and required access roads must be clearly defined. 2. Recommendations of the surface water report must be implemented. 3. Delivery of equipment must be undertaken with the minimum amount of trips to reduce the carbon footprint of these activities 4. Access of all construction and material delivery vehicles should be strictly controlled, especially during wet weather to avoid compaction and damage to the topsoil structure. 5. Damping down of the un-surfaced roads must be implemented to reduce dust and nuisance. 6. Vehicles and equipment shall be serviced regularly to avoid the contamination of soil from oil and hydraulic fluid leaks etc. 7. Servicing must be done in dedicated service areas on site or else off site if no such area exists. 8. Oil changes must take place on a concrete platform and over a drip tray to avoid pollution. 9. Soils compacted by construction shall be deep ripped to loosen compacted layers and re-graded to even running levels.	

	Access 1. The main routes on the site must be clearly sign posted and printed delivery maps must be issued to all suppliers and Sub-contractors. 2. Planning of access routes to the site for construction purposes shall be done in conjunction with the Contractor and the Landowner. All agreements reached should be documented and no verbal agreements should be made. The Contractor shall clearly mark all access roads. Roads not to be used shall be marked with a “NO ENTRY for construction vehicles" sign. 3. Access to the site must be via secondary roads as requested by SANRAL. **Road maintenance** 1. Where necessary suitable measures shall be taken to rehabilitate damaged areas. 2. Contractors should ensure that access roads are maintained in good condition by attending to potholes, corrugations and stormwater damages as soon as these develop. 3. If necessary, staff must be employed to clean surfaced roads adjacent to construction sites where materials have spilt. 4. Recommendations of the surface water report must be taken into consideration. **General** 1. The Main Contractor shall meet safety requirements under all circumstances. All equipment transported shall be clearly labelled as to their potential hazards according to specifications. All the required safety labelling on the containers and trucks used shall be in place. 2. The Main Contractor shall ensure that all the necessary precautions against damage to the environment and injury to persons are taken.	

	3. Care for the safety and security of community members crossing access roads should receive priority at all times.	

3.4.3 Environmental Education and Training

Table 12: Environmental Education and Training

IMPACT	**ENVIRONMENTAL EDUCATION AND TRAINING** **This section deals with the environmental training of construction employees who will work at the proposed power plants**	**RESPONSIBILITY**
PHASE	**CONSTRUCTION**	**PROJECT COMPANY / MC / ECO**
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION / METHOD STATEMENT	**Environmental training** 1. The project manager must appoint an ECO prior to construction. 2. Ensure that all site personnel have a basic level of environmental awareness training. The Contractor must submit a proposal for this training to the ECO for approval. Topics covered should include: ▪ What is meant by "Environment" ▪ Why the environment needs to be protected and conserved ▪ How construction activities can impact on the environment ▪ What can be done to mitigate against such impacts ▪ Awareness of emergency and spills response provisions ▪ Social responsibility during construction e.g. being considerate to local residents 3. Training should be undertaken by a party such as the ECO who has sufficient expertise and knowledge of environmental issues.	

	4. It is the Main Contractor's responsibility to provide the site foreman with no less that 1 hour's environmental training and to ensure that the foreman has sufficient understanding to pass this information onto the construction staff. 5. Training should be provided to the staff members in the use of the appropriate fire-fighting equipment. Translators are to be used where necessary. 6. Use should be made of environmental awareness posters on site. 7. The need for a "clean site" policy also needs to be explained to the workers. 8. Staff operating equipment (such as loaders, etc.) shall be adequately trained and sensitized to any potential hazards associated with their tasks. **Monitoring of environmental training** 1. The Contractor must monitor the performance of construction workers to ensure that the points relayed during their introduction have been properly understood and are being followed. If necessary, the ECO and / or a translator should be called to the site to further explain aspects of environmental or social behaviour that are unclear. Toolbox talks are recommended.	

3.4.4 *Soils and Geology*

General guidelines for management of soils are provided in **Appendix F**.

Table 13: Soils and Geology

IMPACT	**SOILS AND GEOLOGY** **This section deals with soils and geology and actions that need to be implemented during construction**	**RESPONSIBILITY**
PHASE	**CONSTRUCTION**	**MC / EO / ECO**
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION / METHOD STATEMENT	**Topsoil** 1. The contractor should, prior to the commencement of earthworks determine the average depth of topsoil, and agree on this with the ECO. The full depth of topsoil should be stripped from areas affected by construction and related activities prior to the commencement of foundations. This should include the building footprints, working areas and storage areas. Topsoil must be reused at the where possible to rehabilitate disturbed surface areas. 2. Care must be taken not to mix topsoil and subsoil during stripping. 3. Should any topsoil become polluted the contractor must remove the polluted soil to the full depth of pollution and replace it at his own expense with clean topsoil. 4. Removed polluted topsoil should be transported to a licensed landfill site. 5. The topsoil must be conserved on site in and round the pit area **Soil Stripping** 6. No soil stripping must take place on areas within the site that the contractor does not require for construction works or areas of retained vegetation.	

	7. Subsoil and overburden in all construction and lay down areas should be stockpiled separately to be returned for backfilling in the correct soil horizon order. 8. Construction vehicles must only be allowed to utilize existing tracks or pre-planned access routes. **Soil Stockpiles** 9. Stockpiles should not be situated such that they obstruct natural water pathways. 10. Stockpiles should not exceed 2m in height unless otherwise permitted by the Engineer. 11. If stockpiles are exposed to windy conditions or heavy rain, they should be covered either by vegetation or geofabric, depending on the duration of the project. Stockpiles may further be protected by the construction of berms or low brick walls around their bases. 12. Stockpiles should be kept clear of weeds and alien vegetation growth by regular weeding. 13. Where contamination of soil is expected, analysis must be done prior to disposal of soil to determine the appropriate disposal route. Proof from an approved waste disposal site where contaminated soils are dumped if and when a spillage / leakage occurs should be attained and given to the project manager. **Fuel storage** 14. Topsoil and subsoil to be protected from contamination. This should be monitored on a monthly basis by a visual inspection of diesel/oil spillage and pollution prevention facilities. 15. Fuel and material storage must be away from stockpiles.	

	16. Concrete and chemicals must be mixed on an impervious surface and provisions should be made to contain spillages or overflows into the soil. 17. Any storage tanks containing hazardous materials must be placed in bunded containment areas with sealed surfaces. The bund walls must be high enough to contain 110% of the total volume of the stored hazardous material. **Concrete mixing** 18. Should a concrete batching plant be required, it must be contained within a bunded area. 19. Concrete mixing must only take place within designated areas. 20. Ready mixed concrete must be utilised where possible. 21. Vehicles transporting concrete to site may only wash on site at designated wash out facilities. 22. Sediment controls are required at the batching plant to ensure that cement and sand particles that may accumulate from run-off is contained. Possible measures may include silt netting at strategic points. This will disrupt and prevent accelerated run-off as well as trap sediment in storm water run-off. Where cement spills are identified at the batching plant, these must be cleared immediately. **Earthworks** 23. Soils compacted during construction should be deeply ripped to loosen compacted layers and re-graded to even running levels. Topsoil should be re-spread over landscaped areas. According to specifications, the area should be re-vegetated / rehabilitated upon completion of construction activities.	

3.4.5 Erosion Control

Table 14: Erosion Control

IMPACT	**EROSION CONTROL** **This section deals with erosion and actions that need to be implemented during construction**	**RESPONSIBILITY**
PHASE	**CONSTRUCTION**	**MC / EO / ECO**
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION / METHOD STATEMENT	1. Wind screening and stormwater control should be undertaken to prevent soil loss from the site. 2. The use of silt fences and sand bags must be implemented in areas that are susceptible to erosion. 3. Other erosion control measures that can be implemented are as follows: ▪ Brush packing with cleared vegetation ▪ Mulch or chip packing ▪ Planting of vegetation ▪ Hydroseeding / hand sowing 4. Sensitive areas need to be identified prior to construction so that the necessary precautions can be implemented. 5. All erosion control mechanisms need to be regularly maintained. 6. Seeding of topsoil and subsoil stockpiles to prevent wind and water erosion of soil surfaces, where possible. 7. Retention of vegetation where possible to avoid soil erosion 8. Vegetation clearance should be phased to ensure that the minimum area of soil is exposed to potential erosion at any one time. 9. Re-vegetation of disturbed surfaces should occur immediately after	

	construction activities are completed. This should be done through seeding with indigenous grasses. 10. No impediment to the natural water flow other than approved erosion control works is permitted. 11. To prevent stormwater damage, the increase in stormwater run-off resulting from construction activities must be estimated and the drainage system assessed accordingly. 12. Stockpiles not used in three (3) months after stripping must be seeded to prevent dust and erosion.	

3.4.6 Water Use and Quality

Table 15: Water Use and Quality

IMPACT	**WATER USE AND QUALITY** **This section deals with water use and quality as well as actions that need to be implemented during construction**	**RESPONSIBILITY**
PHASE	**CONSTRUCTION**	**MC / EO / ECO / SO**
MITIGATION / METHOD STATEMENT	**Water Use** 1. Develop a sustainable water supply management plan to minimize the impact to natural systems by managing water use, avoiding depletion of aquifers and minimizing impacts to water users. 2. Water must be reused, recycled or treated where possible. 3. Consultation with key stakeholders to understand any conflicting water use demands and the communities dependency on water resources and conservation requirements within the area.	

	Water Quality 1. The quality and quantity of effluent streams discharged to the environment including stormwater should be managed and treated to meet applicable effluent discharge guidelines. 2. Efficient oil and grease traps or sumps should be installed and maintained at refuelling facilities, workshops, fuel storage depots, and containment areas and spill kits should be available with emergency response plans. **Stormwater** 1. The site must be managed in order to prevent pollution of drains, downstream watercourses or groundwater, due to suspended solids and silt or chemical pollutants. 2. Silt fences should be used to prevent any soil entering the stormwater drains. 3. Temporary cut off drains and berms may be required to capture stormwater and promote infiltration. 4. Promote a water saving mind set with construction workers in order to ensure less water wastage. 5. New stormwater construction must be developed strictly according to specifications from engineers in order to ensure efficiency. 6. Hazardous substances (fuel) must be stored at least 100m from any water bodies on site to avoid pollution. 7. The installation of the stormwater system must take place as soon as possible to attenuate stormwater from the construction phase as well as the operation phase. 8. Earth, stone and rubble is to be properly disposed of, or utilized on site so as not to obstruct natural water path ways over the site. i.e. these materials must not be placed in stormwater channels, drainage lines or rivers.	

	9. There should be a periodic checking of the site's drainage system to ensure that the water flow is unobstructed. 10. If a batching plant is necessary, run-off should be managed effectively to avoid contamination of other areas of the site. Untreated runoff from the batch plant must not be allowed to get into the storm water system or nearby streams, rivers or erosion channels or dongas. **Sanitation** 1. Adequate temporary sanitary facilities and ablutions must be provided for construction workers (1 toilet per every 15 workers). 2. The facilities must be regularly serviced to reduce the risk of surface or groundwater pollution. **Concrete mixing** 1. Concrete contaminated water must not enter soil or any natural drainage system as this disturbs the natural acidity of the soil and affects plant growth. **Public areas** 1. Food preparation areas should be provided with adequate washing facilities and food refuse should be stored in sealed refuse bins which should be removed from site on a regular basis. 2. The contractor should take steps to ensure that littering by construction workers does not occur and persons should be employed on site to collect litter from the site and immediate surroundings, including litter accumulating at fence lines. 3. No washing or servicing of vehicles on site.	

3.4.7 Surface and Groundwater

Table 16: Surface and Groundwater

IMPACT	**SURFACE WATER AND GROUNDWATER** **This section deals with surface and groundwater and actions that need to be implemented during construction**	**RESPONSIBILITY**
PHASE	**CONSTRUCTION**	**MC / EO / ECO**
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION / METHOD STATEMENT	**Hazardous materials** 1. Use and or storage of materials, fuel and chemicals which could potentially leak into the ground must be controlled. 2. All storage tanks containing hazardous materials must be placed in bunded containment areas with sealed surfaces. The bund walls must be high enough to contain 110% of the total volume of the stored hazardous material. 3. Any hazardous substances must be stored at least 100m from any of the water bodies on site. 4. The Contractor (monitored by the Environmental Control Officer or Environmental Officer) should be responsible for ensuring that potentially harmful materials are properly stored in a dry, secure, ventilated environment, with concrete or sealed flooring and a means of preventing unauthorised entry. 5. Contaminated wastewater must be managed by the Contractor to ensure existing water resources on the site are not contaminated. All wastewater from general activities in the camp shall be collected and removed from the site for appropriate disposal at a licensed	

	commercial facility. **Concrete mixing** 1. Concrete contaminated water must not enter soil or any natural drainage system as this disturbs the natural acidity of the soil and affects plant growth **Public areas** 1. Food preparation areas should be provided with adequate washing facilities and food refuse should be stored in sealed refuse bins which should be removed from site on a regular basis. 2. The contractor should take steps to ensure that littering by construction workers does not occur and persons should be employed on site to collect litter from the site and immediate surroundings, including litter accumulating at fence lines. 3. No washing or servicing of vehicles on site. **Water resources** 1. Site staff shall not be permitted to use any other open water body or natural water source adjacent to or within the designated site for the purposes of bathing, washing of clothing or for any construction or related activities. 2. Relevant departments and other emergency services should be contacted in order to deal with spillages and contamination of aquatic environments.	
	SITE SPECIFIC MITIGATION MEASURES	
	1. It is strongly recommended that roads should be aligned to not run across drainage features at the head of valleys where valley seeps	

	tend to occur, as these are sensitive areas. Analysis of the development site indicates that the most eroded areas typically occur at the head of catchments within these valley heads, and as such these areas are particularly vulnerable to erosion. Should the construction of roads across the head of drainage systems be unavoidable, particular care should be taken to ensure that construction practices do not cause erosion, and that stormwater runoff is carefully managed so as not to induce scouring of the water features. 2. Existing access roads and tracks across wetlands must be used as far as possible, as these are typically associated with an existing impact on a wetland / stream. It is preferable for existing drifts / causeways to be upgraded rather than new road structures built into an un-impacted section of the surface water feature. 3. Where new access (roads are required and the necessary authorisations and licences are obtained (i.e. water use licence and environmental authorisation), these roads must be limited in extent (i.e. go directly to the desired tower) and will need to be maintained. 4. Ideally, if access roads are required inside the watercourses, coarse gravel should be used. This material will not erode away easily after rainfall events and will provide a relatively solid foundation when surface water accumulates. 5. If dirt roads will be the means of access, these will have to be regularly monitored and checked for erosion during the construction phase. Monitoring should be conducted on a weekly to monthly basis. Moreover, after short or long periods of heavy rainfall or after long periods of sustained rainfall, the roads will need to be checked	

	for erosion and the necessary rehabilitation measures will need to be employed. 6. Where erosion begins to take place, this must be dealt with immediately to prevent severe erosion damage to the watercourses and the associated buffer zones. Should large scale erosion occur, a rehabilitation plan will be required. Input from a suitably qualified wetland or aquatic specialist must be obtained. 7. Where surface water features cannot be spanned by bridges, road design must incorporate a sufficient number and volume of culverts to allow flow within it to pass under the road in an as natural a manner as possible; i.e. flow within the feature should be kept as diffuse as possible, especially where diffuse flow occurs. 8. Measures to minimise stormwater ingress into surface water features off roads should be included in the design of the road. Stormwater from a road in the catchment of the feature should be directed into a deposition / swale area where it can infiltrate the ground and flow slowly into the feature, and not directly into it. 9. Road design should take into account the potential for flooding and spate flows in wetlands, especially within valley bottom wetlands and along riverine corridors. Due to the nature of runoff in the Study Area, high flow peaks are likely to occur in the larger valley bottom drainage features due to the intermittent nature of rainfall and the development of soil crusting in many parts of the site as discussed above. 10. Every effort should be made to avoid placing towers in surface water features, in particular wetlands. 11. All relevant Eskom Distribution environmental procedures to mitigate impacts related to wetlands and other surface water	

	resources, especially those impacts related to construction activities and servitude management should be followed. Should these procedures be followed as stipulated in all Eskom power line construction projects, the majority of these impacts will be avoided or reduced to an acceptable level. 12. Construction activities may not take place within the 1:100 year floodline or within a horizontal distance of 100 meters from any watercourse, whichever is greatest, unless authorisation is granted in terms of Sections 39 or 40 of the NWA by the Department of Water Affairs.. Similar steps must be taken to ensure that construction camp/site will not be located within this specific area. . 13. The development may not impede natural drainage lines of the proposed study area. 14. No abstraction of water from a water resource may take place unless authorisation is granted. 15. The development and implementation of an adequate storm water management plan to be designed by an appropriate engineer will assist in formulating adequate measures to address any potential stormwater impacts from occurring. Here, the engineer should account for both natural run-off (that which can be released into the natural landscape with no detrimental effect) and excess artificial run-off generated over the exposed bare construction laydown areas. In order to prevent acceleration of stormwater run-off, energy dissipating structures can be used. Such structures can reduce the amount and rate of excess run-off generated by the proposed development entering wetlands and thereby prevent the onset of erosion. 16. Stormwater management structures or devices should also take	

	into account the potential for sedimentation and siltation effects associated with stormwater run-off. In this instance, exposed bare areas should be contained by silt fencing or other appropriate devices or materials to trap sediment and dissipate stormwater run-off. 17. Stormwater must be diverted from the construction works and roads must be managed in such a manner as to disperse runoff and to prevent the concentration of stormwater flow. 18. Increased runoff due to vegetation clearance and/or soil compaction must be managed and steps be taken to ensure stormwater does not lead to bank instability and excessive levels of silt entering the watercourse. 19. The necessary erosion prevention mechanisms must be employed to ensure the sustainability of all structures to be placed on site. 20. Oils and other pollutants must be disposed of at an appropriate licenced site, with the necessary agreement from the owner of such a site. 21. Pollutions caused by spills from the construction vehicles must be prevented through proper maintenance and effective protective measures. 22. Any pollution incidences during the construction and operational phases should be reported to DWA within 24 hours.	

3.4.8 Waste Management

Table 17: Waste Management

IMPACT	**WASTE MANAGEMENT** **This section deals with waste management and actions that need to be implemented during construction**	**RESPONSIBILITY**
PHASE	**CONSTRUCTION**	**MC / EO / ECO**
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION / METHOD STATEMENT	**Litter management** 1. Refuse bins must be placed at strategic positions to ensure that litter does not accumulate within the construction site. 2. The Contractor shall supply waste collection bins where such is not available and all solid waste collected shall be disposed of at registered/licensed landfill. 3. A housekeeping team should be appointed to regularly maintain the litter and rubble situation on the construction site. 4. If possible and feasible, all waste generated on site must be separated into glass, plastic, paper, metal and wood and recycled. 5. Littering by the employees of the Contractor shall not be allowed under any circumstances. The ECO shall monitor the neatness of the work sites as well as the Contractor campsite. 6. Skip waste containers should be maintained on site. These should be kept covered and arrangements made for them to be collected regularly. 7. All waste must be removed from the site and transported to a landfill site promptly to ensure that it does not attract vermin or produce	

	odours. 8. Where a registered waste site is not available close to the construction site, the Contractor shall provide a method statement with regard to waste management. 9. A certificate of disposal shall be obtained by the Contractor and kept on file, if relevant. 10. Under no circumstances may solid waste be burnt on site. 11. All waste must be removed promptly to ensure that it does not attract vermin or produce odours. **Hazardous waste** 1. All waste hazardous materials, if present, must be carefully stored as advised by the ECO, and then disposed of off site at a licensed landfill site, where practical. Incineration may be used where relevant. 2. Contaminants to be stored safely to avoid spillage. 3. Machinery must be properly maintained to keep oil leaks in check 4. All necessary precaution measures shall be taken to prevent soil or surface water pollution from hazardous materials used during construction and any spills shall immediately be cleaned up and all affected areas rehabilitated **Sanitation** 1. The Contractor shall install mobile chemical toilets on the site. 2. Staff shall be sensitised to the fact that they should use these facilities at all times. No indiscriminate sanitary activities on site shall be allowed. 3. Ablution facilities shall be within 50m from workplaces and not closer than 100m from any natural water bodies or boreholes. There should be enough toilets available to accommodate the workforce (minimum	

	requirement 1: 15 workers). Male and females must be accommodated separately where possible. 4. Toilets shall be serviced regularly and the ECO shall inspect toilets regularly. 5. Toilets should be no closer than 100m or within the 1:100 year flood line from any natural or manmade water bodies or drainage lines or alternatively located in a place approved of by the Engineer. 6. Under no circumstances may open areas, neighbours fences or the surrounding bush be used as a toilet facility. 7. The construction of “Long Drop” toilets are forbidden. Rather, portable toilets are to be used. 8. Potable water must be provided for all construction staff. **Remedial actions** 1. Depending on the nature and extent of the spill, contaminated soil must be either excavated or treated on-site. 2. Excavation of contaminated soil must involve careful removal of soil using appropriate tools/machinery to storage containers until treated or disposed of at a licensed hazardous landfill site. 3. The ECO must determine the precise method of treatment for polluted soil. This could involve the application of soil absorbent materials as well as oil-digestive powders to the contaminated soil. 4. If a spill occurs on an impermeable surface such as cement or concrete, the surface spill must be contained using oil absorbent material. 5. If necessary, oil absorbent sheets or pads must be attached to leaky machinery or infrastructure. 6. Materials used for the remediation of petrochemical spills must be used according to product specifications and guidance for use.	

	7. Contaminated remediation materials must be carefully removed from the area of the spill so as to prevent further release of petrochemicals to the environment, and stored in adequate containers until appropriate disposal.	

3.4.9 Flora

Table 18: Flora

IMPACT	**FLORA** **This section deals with flora and actions that need to be implemented during construction**	**RESPONSIBILITY**
PHASE	**CONSTRUCTION**	**MC / EO / ECO**
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION / METHOD STATEMENT	**Existing vegetation** 1. Vegetation removal must be limited to the wind farm construction site 2. Vegetation to be removed as it becomes necessary rather than removal of all vegetation throughout the site in one step 3. Materials should not be delivered to the site prematurely which could result in additional areas being cleared or affected. 4. No vegetation to be used for firewood. **Rehabilitation** 1. All damaged areas shall be rehabilitated upon completion of the contract 2. Re-vegetation of the disturbed site is aimed at approximating as near as	

	possible the natural vegetative conditions prevailing prior to construction. 3. All natural areas impacted during construction must be rehabilitated with locally indigenous species typical of the representative botanical unit. 4. Rehabilitation must take place in a phased approach as soon as possible. 5. Rehabilitation process must make use of species indigenous to the area. Seeds from surrounding seed banks can be used for re-seeding. 6. Rehabilitation must be executed in such a manner that surface run-off will not cause erosion of disturbed areas. 7. Planting of indigenous tree species in areas not to be cultivated or built on must be encouraged. **Demarcation of construction and laydown areas** 1. All plants not interfering with the operation of the wind farm construction shall be left undisturbed, clearly marked and indicated on the site plan. 2. The construction area must be well demarcated and no construction activities must be allowed outside of this demarcated footprint. 3. Vegetation removal must be phased in order to reduce impact of construction. 4. Construction site office and laydown areas must be clearly demarcated and no encroachment must occur beyond demarcated areas. 5. Strict and regular auditing of the wind farm construction process to ensure containment of the construction and laydown areas. 6. Soils must be kept free of petrochemical solutions that may be kept on site during construction. Spillage can result in a loss of soil functionality thus limiting the re-establishment of flora.	

	Utilisation of resources 1. Gathering of firewood, fruit, muti plants, or any other natural material onsite or in areas adjacent to the site is prohibited unless with prior approval of the ECO. **Exotic vegetation** 1. Alien vegetation on the site will need to be controlled. 2. The contractor should be responsible for implementing a programme of weed control (particularly in areas where soil has been disturbed); and grassing of any remaining stockpiles to prevent weed invasion. 3. The spread of exotic species occurring throughout the site should be controlled. **Herbicides** 1. Herbicide use shall only be allowed according to contract specifications. The application shall be according to set specifications and under supervision of a qualified technician. The possibility of leaching into the surrounding environment shall be properly investigated and only environmentally friendly herbicides shall be used. 2. The use of pesticides and herbicides on the site must be discouraged as these can impact on important pollinator species of indigenous vegetation.	
	SITE SPECIFIC MITIGATION MEASURES	
	1. Demarcation of sensitive areas is to be undertaken prior to construction activities starting. 2. Use of appropriate construction methods must be undertaken in the sensitive area(s). 3. Intensive environmental audits (frequently in sensitive areas) by an	

	independent party are to be undertaken during the construction period. 4. A copy of the Final Environmental Impact Report and associated Final Environmental Management Programme as well as the specialist study must be present at the construction site in hard copy format for easy reference to specialist recommendations in sensitive areas. 5. It is recommended that the construction crew be educated about the sensitivities involved in these areas as well as the potential species they could encounter. A poster of sensitive species (compiled by a qualified specialist) should be kept on the construction site for easy reference. 6. Rehabilitation to be undertaken as soon as possible after construction in sensitive area has been completed 7. Only vegetation within the study area must be removed. 8. Vegetation removal must be phased in order to reduce impact of construction. 9. Construction site office and laydown areas must be clearly demarcated and no encroachment must occur beyond demarcated areas. 10. All natural areas impacted during construction must be rehabilitated with locally indigenous plant species. 11. A buffer zone must be established in areas where construction will not take place to ensure that construction activities do not extend into these areas. This will need to be clearly and visibly demarcated. 12. Construction areas must be well demarcated and these areas strictly adhered to. 13. The use of pesticides and herbicides in the study area must be discouraged as these impacts on important pollinator species of indigenous vegetation. 14. Soils must be kept free of petrochemical solutions that may be kept on site during construction. Spillage can result in a loss of soil functionality	

	thus limiting the re-establishment of flora. 15. The grid access power line must span rocky areas in order to avoid transformation in these areas. 16. The EO must be present when towers are placed in this area. 17. The Project Company must ensure that the necessary permits are obtained from the Department of Environment and Nature Conservation (DENC) should any plant species of special concern be affected by the proposed development. This may include TOPS, CITES listed species and species listed in terms of the provincial Nature Conservation Ordinance of 1974 and the Northern Cape Nature Conservation Act of 2009. 18. All possible efforts should be made to minimise impacts on protected plants and the appointed ECO should preferably be a qualified botanist with knowledge of local plant species. 19. Where the power line route navigates the mountain slope from the plains to the plateau, on account of the slope as well as the presence of ecologically sensitive habitats on the slopes and rocky outcrops, disturbance should be kept a minimum and a permanent service road should not be constructed beneath the power line route. 20. All rocky slopes and ridges deemed sensitive floral areas should be avoided, with access roads being diverted away from this area. Where this is unavoidable, specific measures such as the use of construction tape to cordon the area off during construction is recommended to safe guard these features. 21. Where construction within sensitive areas is unavoidable, sensitive plants will need to be translocated. Importantly, a permit for the relocation/removal and/or destruction of the following species (at the identified locations) as identified in the Noupoort Wind Farm Ecological	

	Walk-through Report (Todd, 2014) is required before any of these listed and protected species can be affected by construction activities: *Brunsvigia radulosa*, *Euphorbia clavarioides*, *Kniphofia ensifoloia*, *Neohenricia sibbettii*, *Pelargonium sidoides* and *Syringodea concolor*.	

3.4.10 Fauna

Table 19: Fauna

IMPACT	**FAUNA** **This section deals with fauna and actions that need to be implemented during construction**	**RESPONSIBILITY**
PHASE	**CONSTRUCTION**	**MC / EO / ECO**
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION / METHOD STATEMENT	1. Demarcation of sensitive areas must be verified on site by the ECO prior to construction activities starting. 2. Use of appropriate construction techniques 3. Rehabilitation to be undertaken as soon as possible after construction has been completed. 4. No trapping or snaring of fauna on the construction site is allowed without a permit (where required) and without prior consultation with the ECO. 5. No faunal species are to be harmed by maintenance staff during any routine maintenance at the development.	
	SITE SPECIFIC MITIGATION MEASURES	
	1.	

	2. Where the power line traverses over farm earthen dams, it is recommended that the power line be fitted with flight diverters. 3. Where the power line route navigates the mountain slope from the plains to the plateau, on account of the slope as well as the presence of ecologically sensitive habitats on the slopes and rocky outcrops, disturbance should be kept a minimum and a permanent service road should not be constructed beneath the power line route. 4. All rocky slopes and ridges deemed sensitive faunal areas should be avoided, with access roads being diverted away from this area. Where this is unavoidable, specific measures such as the use of construction tape to cordon the area off during construction is recommended to safe guard these features. 5. Access road routes are required to detour away / around any faunal burrows present on site.	

3.4.11 Air Quality

Table 20: Air Pollution

IMPACT	**AIR POLLUTION** **This section deals with air pollution and actions that need to be implemented during construction**	**RESPONSIBILITY**
PHASE	**CONSTRUCTION**	**MC / EO / ECO**
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION	**Dust control** 1. Wheel washing and damping down of un-surfaced and un-vegetated	

	areas must be undertaken if required. 2. Retention of vegetation where possible will reduce dust travel. 3. Clearing activities must only be done during agreed working times and permitting weather conditions to avoid drifting of sand and dust into neighbouring areas. 4. Damping down of all exposed soil surfaces with a water bowser or sprinklers when necessary to reduce dust. 5. The Contractor shall be responsible for dust control on site to ensure no nuisance is caused to the neighbouring communities. 6. A speed limit of 40 km/h must not be exceeded on site. 7. Any complaints or claims emanating from the lack of dust control shall be attended to immediately by the Contractor. 8. Any dirt roads that are utilised by the workers must be regularly maintained to ensure that dust levels are controlled. **Odour control** 1. Regular servicing of vehicles in order to limit gaseous emissions. 2. Regular servicing of on-site toilets to avoid potential odours. 3. Allocated cooking areas must be provided. 4. The contractor must make alternative arrangements (other than fires) for cooking and/ or heating requirements. LP gas cookers may be used provided that all safety regulations are followed. **Rehabilitation** 1. The contractor should commence rehabilitation of exposed soil surfaces as soon as practical after completion of earthworks. **Fire prevention**	

	1. No open fires shall be allowed on site under any circumstance outside of the designated area. All cooking shall be done in demarcated areas that are safe and cannot cause runaway fires. 2. The Contractor shall have operational fire-fighting equipment available on site at all times. The level of fire-fighting equipment must be assessed and evaluated through a typical risk assessment process.	

3.4.12 Noise and Vibrations

Table 21: Noise and Vibrations

IMPACT	**NOISE** **This section deals with noise and actions that need to be implemented during construction**	**RESPONSIBILITY**
PHASE	**CONSTRUCTION**	**MC / EO / ECO**
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION / METHOD STATEMENT	1. The construction phase must aim to adhere to the relevant noise regulations and limit noise to within standard working hours in order to reduce disturbance of surrounding farms. 2. Construction site yards, workshops, concrete batching plants, and other noisy fixed facilities should be located well away from noise sensitive areas. Once the proposed final layouts are made available by the contractor(s), the sites must be evaluated in detail and specific measures designed in to the system. 3. Truck traffic should be routed away from noise sensitive areas, where possible. 4. Noise levels must be kept within acceptable limits.	

	5. Noisy operations should be combined so that they occur where possible at the same time. 6. Construction activities are to be contained to reasonable hours during the day and early evening. Should construction need to take place in the evenings, immediate landowners will need to be notified prior to undertaking construction activities. 7. Noisy activities to take place during allocated construction hours 8. Noise from labourers must be controlled. 9. Noise suppression measures must be applied to all construction equipment. Construction equipment must be kept in good working order and where appropriate fitted with silencers which are kept in good working order. Should the vehicles or equipment not be in good working order, the contractor may be instructed to remove the offending vehicle or machinery from site 10. The contractor must take measures to discourage labourers from loitering in the area and causing noise disturbance. Where possible labour shall be transported to and from the site by the contractor or his Sub-Contractors by the contractors own transport. 11. Implementation of enclosure and cladding of processing plants 12. Applying regular and thorough maintenance schedules to equipment and processes. An increase in noise emission levels very often is a sign of the imminent mechanical failure of a machine.	
	SITE SPECIFIC MITIGATION	
	1. Route construction traffic is to take place as far as practically possible from potentially sensitive receptors. 2. Ensure a good working relationship between the Project Company and all potentially sensitive receptors. Communication channels should be established to ensure prior notice to the sensitive receptor if work is to	**Project Company / MC / EO / ECO**

	take place close to them. Information that should be provided to the potential sensitive receptor(s) include: a. Proposed working times; b. how long the activity is anticipated to take place; c. what is being done, or why the activity is taking place; d. contact details of a responsible person where any complaints can be lodged should there be an issue of concern. 3. When working near (within 500 meters – potential construction of access roads and trenches) to a potential sensitive receptor(s), limit the number of simultaneous activities to the minimum as far as possible. 4. When working near to potentially sensitive receptors, coordinate the working time with periods when the receptors are not at home where possible. 5. A monitoring programme must be implemented before the operation of the wind farm confirming the validity of the regression analysis of non-site specific data. 6. The ambient sound environment must be defined by using 10 minute bins over a period of at least 7 days before the operational phase starts inside and outside of the dwelling at NSD06 and NSD08. 10minute sampling bins should be co-ordinated with 10 m wind speed if possible. 7. Construction staff must be trained in actions to minimise noise impacts. 8. The holder of the environmental authorisation must ensure that the National Noise Control Regulations and SANS10103:2008 are adhered to and measures to limit noise from the work site are implemented. 9. The holder of the environmental authorisation must ensure that the construction staff working in areas where the 8 hour ambient noise levels exceed 75 DBa must wear ear protection.	

	10. The holder of the environmental authorisation must ensure that all equipment and machinery are well maintained and equipped with silencers. 11. The holder of the environmental authorisation must provide prior warning to the community when a noisy activity (i.e. blasting) is to take place. **Technical solutions for mitigating construction impacts** 1. Using the smallest/quietest equipment for the particular purpose. For modelling purposes the noise emission characteristics of large earth-moving equipment (typically of mining operations) were used, that would most likely over-estimate the noise levels. The use of smaller equipment therefore would have a significantly lower noise impact. 2. Ensuring that equipment is well-maintained and fitted with the correct and appropriate noise abatement measures.	

3.4.13 Energy use

Table 22: Energy use

IMPACT	**ENERGY USE** **This section deals with energy use and actions that need to be implemented during construction**	**RESPONSIBILITY**
PHASE	**CONSTRUCTION**	**MC / EO**
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION / METHOD	1. Energy saving lighting must be implemented across the board. 2. Water saving measures must be implemented across the plant to	

STATEMENT	ensure little wastage. 3. Minimal lighting, while maintaining health and safety regulations, must be kept on during the night operations. 4. Equipment not in use must be switched off and unplugged to save on unnecessary energy costs.	

3.4.14 Agricultural Potential

Table 23: Agricultural Potential

IMPACT	**AGRICULTURAL POTENTIAL** **This section deals with agricultural potential and actions that need to be implemented during construction**	**RESPONSIBILITY**
PHASE	**CONSTRUCTION**	**MC / EO / ECO**
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION / METHOD STATEMENT	1. The development footprint must be maintained and not encroach on agricultural areas on the site as well as the nearby drainage areas. 2. Avoid the active Lucerne and subsistence agricultural fields identified. 3. Due to the overarching site characteristics and the nature of the proposed development viable mitigation measures are limited and will most likely revolve around erosion control: a. Clearing activities should be kept to a minimum (turbine. Road, Operation and Maintenance Buildings, and Substation site footprints). b. In the unlikely event that heavy rains are expected activities should be put on hold to reduce the risk of erosion.	

	c. If additional earthworks are required, any steep or large embankments that are expected to be exposed during the 'rainy' months should either be armoured with fascine like structures. 4. If earth works are required then storm water control and wind screening should be undertaken to prevent soil loss from the site	

3.4.15 Employment

Table 24: Employment

IMPACT	**EMPLOYMENT** **This section deals with employment and actions that need to be implemented during construction**	**RESPONSIBILITY**
PHASE	**CONSTRUCTION**	**MC / ECO / SO**
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION / METHOD STATEMENT	**Labour** 1. The use of labour intensive construction measures should be used where appropriate. 2. Training of labour to benefit individuals beyond completion of the project should be sought for. **Recruitment Plan** 3. The bulk of unskilled labourers should be drawn from the local market i.e. from the Noupoort area, and where possible use should be made of local semiskilled and skilled personnel.	

	4. Local suppliers are to be used where possible. 5. The Project Manager must ensure that all staff working on the proposed project are in possession of a South African Identity Document or a relevant work permit. 6. Ensure adequate advertising in the project community areas, local papers for skilled labour. Adverts are to be placed in each area where the public meetings were conducted. 7. The recruitment process must be equitable and transparent. A concerted effort will be made to guard against nepotism and/or any form of favouritism during the process. 8. Compliance with the Occupational, Health and Safety Act, 1993 (Act. No. 85 of 1993) will be adhered to. 9. Specific commitments are contained in the Implementation Agreement between the Project Company and the DoE, and these will be complied with.	
	SITE SPECIFIC MITIGATION	
	1. Facilitating skills development programmes for unskilled local jobs created during the construction phase	

3.4.16 Occupational Health and Safety

Table 25: Occupational Health and Safety

IMPACT	**HEALTH AND SAFETY** **This section deals with health and safety and actions that need to be implemented during construction**	**RESPONSIBILITY**
PHASE	**CONSTRUCTION**	**MC / EO / ECO**
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION / METHOD STATEMENT	**Worker safety** 1. Implementation of safety measures, work procedures and first aid must be implemented on site. 2. Workers should be thoroughly trained in using potentially dangerous equipment 3. Contractors must ensure that all equipment is maintained in a safe operating condition. 4. A safety officer must be appointed. 5. A record of health and safety incidents must be kept on site. 6. Any health and safety incidents must be reported to the Project Manager immediately. 7. First aid facilities must be available on site at all times and a number of employees trained to carry out first aid procedures. 8. Workers have the right to refuse work in unsafe conditions. 9. The Contractor shall take all the necessary precautions against the spreading of disease such as measles, foot and mouth, etc. especially under livestock. 10. A record shall be kept of drugs administered or precautions taken and	

	the time and dates when this was done. This can then be used as evidence in court should any claims be instituted against the Project Company or the Contractor. 11. The contractor must ensure that all construction workers are well educated about HIV/ AIDS and the risks surrounding this disease. The location of the local clinic where more information and counselling is offered must be indicated to workers. 12. Material stockpiles or stacks must be stable and well secured to avoid collapse and possible injury to site workers / local residents. **Worker facilities** 1. Eating areas should be regularly serviced and cleaned to ensure the highest possible standards of hygiene and cleanliness. 2. Fires are not to be allowed outside controlled areas. **Hazardous substances** 1. Working areas should be provided with adequate ventilation and dust/fume extraction systems to ensure that inhalation exposure levels for potentially corrosive, oxidizing, reactive or siliceous substances are maintained and managed at safe levels. **Machinery and Equipment** 1. Use of contrast colouring on equipment / machinery including the provision of reflective markings to enhance visibility. 2. Use of moving equipment/machinery equipped with improved operator sight lines. 3. Issuing workers with high visibility clothing 4. Use of reflective markings on structures, traffic junctions, and other		

	areas with a potential for accidents. 5. Installing safety barriers in high risk locations **Fitness for work** 1. Review shift management systems to minimize risk of fatigue. Establish alcohol and other drugs policy for the operation. **Travel and remote site health** 1. Develop programs to prevent both chronic and acute illnesses through appropriate sanitation and vector control systems. 2. Where food is prepared on site, food preparation storage and disposal should be reviewed regularly and monitored to minimise risk of illness. **Protective gear** 1. Personal Protective Equipment (PPE) must be made available to all construction staff and must be compulsory. Hard hats and safety shoes must be worn at all times and other PPE worn were necessary i.e. dust masks, ear plugs etc. 2. No person is to enter the site without the necessary PPE. **Site safety** 1. The construction camp must remain fenced for the entire construction period. 2. Potentially hazardous areas are to be demarcated and clearly marked 3. Adequate warning signs of hazardous working areas. 4. Emergency numbers for local police and fire department etc must be placed in a prominent area. 5. Fire-fighting equipment must be placed in prominent positions across	

	the site where it is easily accessible. This includes fire extinguishers, a fire blanket as well as a water tank. 6. Suitable conspicuous warning signs in English and all other applicable languages must be placed at all entrances to the site. 7. All speed limits must be adhered to. **Construction equipment safety** 1. All equipment used for construction, including drills, TLB's must be in good working order with up to date maintenance records. **Hazardous Material Storage** 1. All storage tanks containing hazardous materials (fuel) must be placed in bunded containment areas with sealed surfaces. The bund walls must be high enough to contain 110% of the total volume of the stored hazardous material. These areas should be roofed to avoid contamination of stormwater. 2. Material Safety Data Sheets (MSDS) which contain the necessary information pertaining to a specific hazardous substance must be present for all hazardous materials stored on the site. **Procedure in the event of a petrochemical spill** 1. A spill kit needs to be kept on site to address any unforeseen spillages. 2. The individual responsible for or who discovers the petrochemical spill must report the incident to the Project Manager, Contractor or ECO. 3. The problem must be assessed and the necessary actions required will be undertaken. 4. The immediate response must be to contain the spill. 5. The source of the spill must be identified, controlled, treated or removed	

	wherever possible. **Fire management** 1. Fire-fighting equipment should be present on site at all times. 2. All construction staff must be trained in fire hazard control and fire fighting techniques. 3. All flammable substances must be stored in dry areas which do not pose an ignition risk to the said substances. 4. No open fires will be allowed on site. 5. Smoking may only be conducted in demarcated areas. **Safety of surrounding residents** 1. All I&AP's should be notified in advance of any known potential risks associated with the construction site and the activities on it. Examples of these are: o Blasting o Earthworks / earthmoving machinery on steep slopes above houses / infrastructure o Risk to residence along haulage roads / access routes **Emergency evacuation plan** 1. Upon completion of the construction phase, an emergency preparedness plan must be drawn up to ensure the safety of the staff and surrounding land users in the case of an emergency. 2. All permanent staff must undergo safety training. **Maintenance** 1. The wind farm and surrounding areas are to be regularly maintained. A	

	maintenance schedule must be drawn up and records of all maintenance kept.	
	SITE SPECIFIC MITIGATION	
	1. Problem areas that are brought under the attention of the contractor should be rectified immediately. If the contractor is unable to so, this should be communicated to the landowner along with a plan on how and when the problem will be addressed. The landowner should be given regular feedback on the matter. 2. All mitigation measures contained in the EMPr should be implemented and monitored by an ECO. Remedial action should be taken where the contractor fails to comply with the EMPr. **3.** The HIV/AIDS prevention programme should extend to the local community and should pay special attention to vulnerable groups such as women and youth.	**MC / ECO / SO**

3.4.17 Security

Table 26: Security

IMPACT	**SECURITY** **This section deals with security and actions that need to be implemented during construction**	**RESPONSIBILITY**
PHASE	**CONSTRUCTION**	**MC / EO / ECO**
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION / METHOD	1. A security company should be employed to guard the construction site and monitor access. Furthermore, the contractor has the possibility to	

STATEMENT	manage security in house, using own staff. Labour should be transported to and from the site to discourage loitering in adjacent areas and possible increase in crime or disturbance. 2. Unsocial activities such as consumption or illegal selling of alcohol, drug utilisation or selling and prostitution on site shall be prohibited. Any persons found to be engaged in such activities should receive disciplinary or criminal action taken against them. 3. Only pre-approved staff must be permitted to stay within the staff accommodation which will be provided. 4. The site shall be fenced, where necessary to prevent any loss or injury to persons during the construction phase. 5. No alcohol/ drugs are to be present or taken on site. 6. No firearms allowed on site or in vehicles transporting staff to / from site (unless used by security personnel). 7. No harvesting of firewood from the site or from the business property adjacent to it without prior consent from the ECO. 8. Construction staff are to make use of the facilities provided for them, as opposed to ad-hoc alternatives (e.g. fires for cooking, the use of surrounding bush as a toilet facility are forbidden). 9. Trespassing on private / commercial properties adjoining the site is forbidden. 10. Driving under the influence of alcohol is prohibited. 11. All employees must undergo the necessary safety training and wear the necessary protective clothing. 12. The site must be secured in order to reduce the opportunity for criminal activity in the locality of the construction site.	

3.4.18 Social Environment

Table 27: Social Environment

IMPACT	**SOCIAL ENVIRONMENT** **This section deals with social environment and actions that need to be implemented during construction**	**RESPONSIBILITY**
PHASE	**CONSTRUCTION**	**MC / EO / SO**
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION	1. All contact with the affected parties shall be courteous at all times. The rights of the affected parties shall be respected at all times. 2. A complaints register should be kept on site. Details of complaints should be incorporated into the audits as part of the monitoring process. This should be in carbon copy format, with numbered pages. Any missing pages must be accounted for by the Contractor. 3. Damage to infrastructure shall not be tolerated and any damage shall be rectified immediately by the Contractor. A record of all damage and remedial actions shall be kept on site. 4. Care must be taken not to damage irrigation equipment, lines, channels and crops.	
	SITE SPECIFIC MITIGATION	
Security	1. Problem areas that are brought under the attention of the contractor should be rectified immediately. If the contractor is unable to so, this should be communicated to the landowner along with a plan on how and when the problem will be addressed. The landowner should be given regular feedback on the matter. 2. All mitigation measures contained in the EMPr should be implemented	

	and monitored by an ECO. Remedial action should be taken where the contractor fails to comply with the EMPr.	
Roads	1. Construction traffic should only make use of an approved route. 2. The number of trucks that pass through communities should be kept to a minimum and should be restricted to certain times of the day. 3. General road rules should be enforced.	
Influx of construction workers	1. Alert local businesses to the fact that construction workers will move into the area to enable local businesses to plan for the extra demand.	
Influx of job seekers	1. Ensure that employment procedures/ policy are communicated to local stakeholders. 2. Have clear rules and regulations for access to the camp / site office to control loitering. Consult with the local police to establish standard operating procedures for the control and/or removal of loiterers at the construction site. 3. Construction workers should be clearly identifiable by wearing proper construction uniforms displaying the logo of the construction company. Construction workers could also be issued with identification tags.	
Outflow of labourers	1. Implement methods (posters, talks, etc.) to create HIV and STD awareness amongst construction workers. 2. Payment should comply with applicable Labour Law legislation in terms of minimum wages.	
Direct formal employment opportunities for local individuals	1. Unskilled job opportunities should be afforded to local community members. Local trade unions could assist with the recruitment process to counteract the potential for social mobilisation. 2. Equal opportunities for employment should be created to ensure that the local female population also has access to these opportunities. Females should be encouraged to apply for positions.	

	3. Individuals with the potential to develop their skills should be afforded training opportunities. 4. Mechanisms should be developed to provide alternative solutions for creating job security upon completion of the project. This could include formal and/or informal training on how to look for alternative employment, information on career progression, etc. to ensure that people are equipped to seek other jobs with the skills that they have gained. 5. Payment should comply with applicable Labour Law legislation in terms of minimum wages.	
Indirect formal and/or informal employment opportunities for local individuals	1. Develop a procurement policy that is easy to understand and ensure that local subcontractors also comply with the procurement policy and any other applicable policies. 2. Agree on specific performance criteria prior to appointment. 3. Encourage construction workers to use local services. 4. Consider housing construction workers in local communities.	
Attitude formation against the project	1. Transparent information should be supplied to the community from the outset of the project. 2. Employment opportunities should first be offered to the local community if the skills are available within the community. 3.	
Disaster Management Plan	1. Develop and implement a disaster management plan for implementation during the construction and operation phase. 2. Identify suitable individuals that can be trained and used as first aid officers on site. Training of these individuals should ideally take place during this phase of the project to ensure that qualified first aid officers are on site once construction commences.	

	3. Establish a fully functional and equipped disaster management centre. 4. Establish disaster prevention programmes that focus on the most vulnerable communities – and, at the same time, support sustainable livelihoods; 5. Establish and maintain fire protection around the wind farm; 6. The way in which the disaster management plan is communicated to the surrounding communities and/or households should be jargon-free and outline an easy to follow step-by-step procedure. Cognisance should be taken of the fact that some members of the surrounding communities and/or households are illiterate – make use of alternative communication methods (e.g. picture posters) to educate and inform these individuals; 7. Where possible, markers should display the emergency contact number.	
Pollution and fire risk	1. Sufficient portable chemical toilets on site during. 2. Refuse on site should be discarded in sealed bins and/or covered skips. Refuse should be removed from the site on regular intervals (at least once a week) and disposed of at an approved waste disposal site. 3. Construction workers should only be allowed to make fire in designated areas. Construction workers who do not keep within designated areas should be fined.	
Sanitation	1. Construction workers should receive medical advice regarding correct sanitation and should receive medical attention where required. 2. Adequate water facilities should be provided.	
Third party tampering	1. Ensure that physical security systems and emergency tactical response measures are adequate and effective. 2. Fence off and control access to key facilities on the development.	
Increase in crime	1. Consultation with the Police and local authorities.	

3.4.19 Heritage

Table 28: Heritage

IMPACT	**CULTURAL AND HERITAGE ARTEFACTS** **This section deals with the impact that the new development has on potential archaeological artefacts of the site**	**RESPONSIBILITY**
PHASE	**CONSTRUCTION**	**MC / EO / ECO**
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION / METHOD STATEMENT	1. Any finds must be reported to the nearest National Monuments office to comply with the National Heritage Resources Act (Act No 25 of 1999) and to DEA. 2. Local museums as well as the South African Heritage Resource Agency (SAHRA) should be informed if any artefacts are uncovered in the affected area. 3. The contractor must ensure that his workforce is aware of the necessity of reporting any possible historical or archaeological finds to the ECO so that appropriate action can be taken. 4. Any discovered artefacts shall not be removed under any circumstances. Any destruction of a site can only be allowed once a permit is obtained and the site has been mapped and noted. Permits shall be obtained from the South African Heritage Resources Association (SAHRA) should the proposed site affect any world heritage sites or if any heritage sites are to be destroyed or altered. 5. Should any archaeological sites / graves be uncovered during construction, their existence shall be reported to Project Company immediately.	

	SITE SPECIFIC MITIGATION MEASURES	
	1. Known sites should be clearly marked in order that they can be avoided during construction activities. 2. Buffer zones are to be clearly and visibly demarcated around the following identified sites: a. Site 1 – Farmstead (150m x 200m): 10m Buffer b. Site 2 – Cemetery (30m x 30m): 10m Buffer c. Site 3 – Rock Shelter (120m x 40m): 50m Buffer d. Site 4 – Farmstead (100m x100m): 10 Buffer e. Site 5 – Stone Walled Structures (50m x 70m): 10m Buffer f. Site 6 - Stone Walled Structures (50m x 50m): 10m Buffer g. Site 7 - Stone Walled Structures (80m x 80m): 10m Buffer h. Site 8 - Stone Walled Structures (30m x 30m): 10m Buffer i. Site 9 - Stone Walled Structures (300m x 300m): 10m Buffer j. Site 10 - Stone Walled Structures (10m x 10m): 10m Buffer k. Site 11 - Stone Walled Structures (10m x 10m): 20m Buffer l. Site 12 - Stone Walled Structures (25m x 25m): 20m Buffer 3. The contractors and workers should be notified that archaeological sites might be exposed during the construction activities. 4. Should any heritage artefacts be exposed during excavation, work on the area where the artefacts were discovered, shall cease immediately and the Environmental Control Officer shall be notified as soon as possible; 5. All discoveries shall be reported immediately to a heritage practitioner so that an investigation and evaluation of the finds can be made. Acting upon advice from these specialists, the Environmental Control Officer will advise the necessary actions to be taken;	

	6. Under no circumstances shall any artefacts be removed, destroyed or interfered with by anyone on the site; and 7. Contractors and workers shall be advised of the penalties associated with the unlawful removal of cultural, historical, archaeological or palaeontological artefacts, as set out in the National Heritage Resources Act (Act No. 25 of 1999), Section 51. (1). 8. In order to achieve this, the following should be in place: a. A person or entity, e.g. the Environmental Control Officer, should be tasked to take responsibility for the heritage sites and should be held accountable for any damage. b. Known sites should be located and isolated, e.g. by fencing them off. All construction workers should be informed that these are no-go areas, unless accompanied by the individual or persons representing the Environmental Control Officer as identified above. 9. In areas where the vegetation is threatening the heritage sites, e.g. growing trees pushing walls over, it should be removed, but only after permission for the methods proposed has been granted by SAHRA. A heritage official should be part of the team executing these measures.	

3.4.20 Palaeontology

Table 29: Palaeontology

IMPACT	**PALAEONTOLOGICAL FINDS** **This section deals with the impact that the new development has on potential archaeological artefacts of the site**	**RESPONSIBILITY**
PHASE	**CONSTRUCTION**	**MC / EO / ECO**
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION / METHOD STATEMENT	1. Any finds must be reported to the nearest National Monuments office to comply with the National Heritage Resources Act (Act No 25 of 1999) and to DEA. 2. Local museums as well as the South African Heritage Resource Agency (SAHRA) should be informed if any palaeontolgoical finds are uncovered in the affected area. 3. The contractor must ensure that his workforce is aware of the necessity of reporting any possible palaeontological finds to the ECO so that appropriate action can be taken. 4. Any discovered artefacts shall not be removed under any circumstances. Any destruction of a site can only be allowed once a permit is obtained and the site has been mapped and noted. Permits shall be obtained from the South African Heritage Resources Association (SAHRA) should the proposed site affect any world heritage sites or if any palaeontological sites are to be destroyed or altered. 5. Should any palaeontological finds be uncovered during construction, their existence shall be reported to MRP immediately.	
	SITE SPECIFIC MITIGATION MEASURES	

	6. The ECO responsible for the developments should be alerted to the possibility of fossil remains being found on the surface or exposed by fresh excavations during construction. Should substantial fossil remains be discovered during construction, these should be safeguarded (preferably in situ) and the ECO should alert SAHRA so that appropriate mitigation (e.g. recording, sampling or collection) can be taken by a professional palaeontologist. 7. The specialist involved would require obtaining a collection permit from SAHRA. Fossil material must be curated in an approved repository (e.g. museum or university collection) and all fieldwork and reports should meet the minimum standards for palaeontological impact studies developed by SAHRA.	

3.4.21 Community Engagement

Table 30: Community Engagement

IMPACT	**COMMUNITY ENGAGEMENT** **This section deals with surrounding community and actions that need to be implemented during construction**	**RESPONSIBILITY**
PHASE	**CONSTRUCTION**	**EO / SO**
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION	1. Open and transparent community engagement to be followed as culturally appropriate. 2. Records (written) are to be kept of all community engagements (e.g. complaints, resolutions, etc).	

3.4.22 Visual Impact

Table 31: Visual Impact

IMPACT	**VISUAL** **This section deals with visual issues and actions that need to be implemented during construction**	**RESPONSIBILITY**
PHASE	**CONSTRUCTION**	**MC / EO / EO**
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION / METHOD STATEMENT	1. Construction traffic must stick to designated routes or access roads; 2. Construction areas are to be kept clean and tidy 3. Measures must be taken to suppress dust arising from construction activities 4. Labour being transported to the site must take cognisance of litter and waste concerns 5. Topsoil stockpiles must be well managed and seeded when possible if not utilised within three months 6.	

3.4.23 Bats

Table 32: Bats Impact

IMPACT	**BATS** **This section deals with bats issues and actions that need to be implemented during construction**	**RESPONSIBILITY**
PHASE	**CONSTRUCTION**	**PROJECT COMPANY / MC / EO / ECO**
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION / METHOD STATEMENT	1. None	

3.4.24 Avi-fauna

Table 33: Avi-fauna Impact

IMPACT	**AVI-FAUNA** **This section deals with avi-faunal issues and actions that need to be implemented during construction**	**RESPONSIBILITY**
PHASE	**CONSTRUCTION**	**MC / EO / ECO**
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION / METHOD STATEMENT	1. Ensuring that key areas of conservation importance and sensitivity are avoided, in this instance slopes and potential funnels of bird flight activity.	

	2. Habitat destruction should be limited to what is absolutely necessary for the construction of the infrastructure, including the construction of new roads. In this respect, the recommendations from the Ecological Specialist Study should be applied strictly. Personnel should be adequately briefed on the need to restrict habitat destruction, and must be restricted to the actual construction area. 3. The proposed power line should be routed as far as possible from high risk areas (e.g. Blue Crane nest, agricultural lands, and dams). In addition, the proposed alignment must be assessed for potential collision risks and those sections must be marked with Bird Flight Diverters. 4. The proposed pole design must be assessed by the author of the Avi - Fauna report to ensure that the power line design poses no potential electrocution risk of large raptors, particularly Martial Eagle, which may use the poles as hunting perches. 5. A 500m exclusion zone is to be implemented around the existing Blue Crane breeding pair where no construction activity is to take place. In addition, no access roads should be constructed within the exclusion zone. 6. The following spans must be marked with Bird Flight Diverters on the earth wire of the line, ten metres apart, alternating black and white for: 7. Spans from Tower Structure 16-17; and 8. Spans from Tower Structure 30-50. 9. It is important that the construction activities, vehicle and pedestrian movement are restricted a much as possible to the actual servitude of the proposed power line. Vehicle traffic in and out of the area should be restricted to what is absolutely necessary for the construction process. Maximum use should be made of existing roads.	

3.5 Operation Phase

3.5.1 Construction Site Decommissioning

Table 34: Construction Site Decommissioning

IMPACT	**CONSTRUCTION SITE DECOMMISSIONING**	**RESPONSIBILITY**
PHASE	**OPERATION**	**MC / Project Company / ECO / EO**
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION	**Removal of equipment** 1. All structures comprising the construction camp are to be removed from site. 2. The area that previously housed the construction camp is to be checked for spills of substances such as oil, paint, etc, and these shall be cleaned up. 3. All hardened surfaces within the construction camp area should be ripped, all imported materials removed, and the area shall be top soiled and regressed using the guidelines set out in the re-vegetation that forms part of this document.	

	Temporary services 1. The Contractor must arrange the cancellation of all temporary services. 2. Temporary roads must be closed and access across these, blocked. 3. All areas where temporary services were installed are to be rehabilitated to the satisfaction of the ECO. **Associated infrastructure** 1. Surfaces are to be checked for waste products from activities such as concreting or asphalting and cleared in a manner approved by the Project Company. 2. All surfaces hardened due to construction activities are to be ripped and imported material thereon removed. 3. All rubble is to be removed from the site to an approved disposal site as approved by the Project Company. Burying of rubble on site is prohibited. 4. The site is to be cleared of all litter. 5. The Contractor is to check that all watercourses are free from building rubble, spoil materials and waste materials. 6. Fences, barriers and demarcations associated with the construction phase are to be removed from the site unless stipulated otherwise by the Project Company. 7. All residual stockpiles must be removed to spoil or spread on site as directed by the Project Company. 8. All leftover building materials must be returned to the depot or removed from the site. 9. The Contractor must repair any damage that the construction works	

	has caused to neighbouring properties, specifically, but not limited to, damage caused by poor storm water management. **Rehabilitation plan** 1. Rehabilitate and re-vegetate cleared areas with indigenous plant species.	

3.5.2 Operation and Maintenance

Table 35: Operation and Maintenance

IMPACT	**OPERATION AND MAINTENANCE**	**RESPONSIBILITY**
PHASE	**OPERATION**	**Project Company / SO**
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION	**Maintenance** 1. All applicable standards, legislation, policies and procedures must be adhered to during operation. 2. Regular ground inspection of the substation must take place to monitor their status. **Public awareness** 3. The emergency preparedness plan must be ready for implementation at all times should an emergency situation arise.	

3.5.3 Surface and Groundwater

Table 36: Surface and Groundwater

IMPACT	**SURFACE AND GROUNDWATER**	**RESPONSIBILITY**
PHASE	**OPERATION**	**Project Company**
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION	**Surface water** 1. Correct drainage of the site should ensure that contaminants do not impact upon surface water. 2. The stormwater system on the proposed site needs to be regularly maintained to ensure effective working. **Monitoring and Reporting** 3. Specific activities that should be monitored include: ▪ Erosion potential (specifically in and around roads and storm-water discharge points). ▪ Stormwater management and design ▪ Identified problem areas	
	SITE SPECIFIC MITIGATION MEASURES	
	1. The development and implementation of an adequate storm water management plan to be designed by an appropriate engineer for the operation phase of the proposed development will assist in formulating adequate measures to address any potential stormwater impacts from occurring. Here, the engineer should account for both natural run-off (that which can be released into the natural landscape with no detrimental effect) and excess artificial	

	run-off generated over the exposed bare construction laydown areas. In order to prevent acceleration of stormwater run-off, energy dissipating structures can be used. Such structures can reduce the amount and rate of excess run-off generated by the proposed development entering wetlands and thereby prevent the onset of erosion. 2. Stormwater management structures or devices should also take into account the potential for sedimentation and siltation effects associated with stormwater run-off. In this instance, exposed bare areas should be contained by silt fencing or other appropriate devices or materials to trap sediment and dissipate stormwater run-off.	

3.5.4 Biodiversity

Table 37: Biodiversity

IMPACT	**BIODIVERSITY (FAUNA AND FLORA)**	**RESPONSIBILITY**
PHASE	**OPERATION**	**Project Company**
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION	**Vegetation** 1. Indigenous vegetation must be maintained and all exotics removed as they appear and disposed off appropriately. 2. Re-vegetation of the disturbed site is aimed at approximating as near as possible the natural vegetative conditions prevailing prior to construction. 3. Vegetative re-establishment shall, as far as possible, make use	

	of indigenous or locally occurring plant varieties within a 20-metre radius of the site. 4. Rehabilitation must be executed in such a manner that surface run-off will not cause erosion of disturbed areas during and following rehabilitation. **Other fauna** 5. No faunal species must be harmed by maintenance staff during any routine maintenance at the development.	
	SITE SPECIFIC MITIGATION MEASURES	
	1. Six monthly checks of the area should take place for the emergence of invader species. 2. Mitigation measures mentioned for the construction phase above must be implemented for any maintenance of the development that may be undertaken during the operation phase. 3. Correct rehabilitation with locally indigenous species. 4. Monitoring programme to ensure that rehabilitation efforts are successful to ensure that risks such as erosion and the edge effect are avoided. 5. Constant maintenance of the area to ensure re-colonisation of floral species. 6. Regular removal of alien species which may jeopardise the proliferation of indigenous species.	

3.5.5 Waste Management

Table 38: Waste Management

IMPACT	**WASTE MANAGEMENT**	**RESPONSIBILITY**
PHASE	**OPERATION**	**Project Company**
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION	**Recycling and litter management** 1. The site should be kept clear of litter at all times. 2. Solid waste separation and recycling should take place for the duration of the operational phase for the development at the administration block. 3. All waste must be removed promptly to ensure that it does not attract vermin or produce odours. 4. In house treatment procedures must be followed strictly. 5. Solid waste should be collected on a regular basis. 6. Package treatment plant must be regularly serviced.	

3.5.6 Health and Safety

Table 39: Health and Safety

IMPACT	**HEALTH AND SAFETY**	**RESPONSIBILITY**
PHASE	**OPERATION**	**Project Company**
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION	**Emergency evacuation plan** 1. Upon completion of the construction phase, an emergency evacuation plan must be drawn up to ensure the safety of the staff and surrounding land users in the case of an emergency. **Maintenance** 2. The wind farm is to be regularly maintained. A maintenance schedule must be drawn up and records of all maintenance kept. **Fire safety** 3. Fire-fighting equipment in the form of fire hydrants or fire extinguishers must be available on the site. These must be regularly maintained by an appropriate company. **Storage and handling of hazardous waste** 1. Transformer oil containers must be regularly maintained to ensure that leaks do not occur. 2. A spill kit needs to be kept on site to address any unforeseen spillages. 3. Transport of all hazardous substances must be in accordance	

IMPACT	HEALTH AND SAFETY	RESPONSIBILITY
	with the relevant legislation. 4. The bund wall surrounding the transformer oil containers must be regularly maintained to ensure that any spills are completely contained.	

3.5.7 Visual Impact

Table 40: Visual Impact

IMPACT	**VISUAL IMPACT**	**RESPONSIBILITY**
PHASE	**OPERATION**	**Project Company**
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION	**Maintenance and lighting** 1. Lighting must be kept to a minimum and restricted to low level, downward facing lights to reduce light spill; 2. Lighting must be inward and downward pointing to reduce glare in surrounding areas. 3. The power plant area and surrounds must be kept clean, tidy and well maintained to reduce negative visual impacts; 4. Rehabilitation of surrounding areas must take place with indigenous species; 5. Surrounding roads must be well maintained; 6. Regular maintenance of exteriors and associated infrastructure must be undertaken.	

3.5.8 Bats

Table 41: Bats Impact

IMPACT	**BATS** **This section deals with bat issues and actions that need to be implemented during construction**	**RESPONSIBILITY**
PHASE	**OPERATION**	**Project Company**
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION / METHOD STATEMENT	1. Post-construction monitoring is strongly recommended in order to confirm unacceptable amounts of bat mortalities, and to confirm the need for any mitigation. Unacceptable amounts would refer to more than 20% of the bat population annually. Should such losses be found during any stage of the post-construction monitoring, mitigation measures as stipulated by the bat specialist and as agreed with by the Project Company are to be undertaken as required.	

3.5.9 Avi-fauna

Table 42: Avi-fauna

IMPACT	**AVI-FAUNA**	**RESPONSIBILITY**
PHASE	**OPERATION**	**Project Company**
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION	1. Formal monitoring should be resumed once the turbines have been constructed, as per best practice guidelines (Jenkins *et al*, 2011). The purposes of this would be to establish if displacement of priority species has occurred and to what extent. The exact time when post-construction monitoring should commence, will depend on the construction schedule, and will be agreed upon with the Project Company once these timelines have been finalised. 2. The duration of the post-construction monitoring would need to be for at least an equivalent period to the pre-construction monitoring (four seasons), thereafter the need for additional monitoring will be determined and agreed to with Project Company, based on the results of the first year of post-construction monitoring. 3. A 500m buffer has already been implemented in the lay-out to accommodate the Blue Cranes that are breeding on the site. This should be strictly enforced as a no turbine zone for the duration of the project. In addition, no access roads should be constructed within that zone. 4. Formal monitoring should be resumed once the turbines have been constructed, as per best practice guidelines (Jenkins et al 2011) (see previous section Displacement). The purpose of this would be (a) to establish if displacement of priority species has occurred and	

	to what extent through the altering of flight patterns post-construction, and (b) to search for carcasses at specific turbines. 5. The on-going inputs of a suitable experienced ornithological consultant will be required to oversee the post-construction monitoring and assist with the on-going adaptive management of bird impacts that may emerge as the post-construction monitoring programme progresses. Depending on the results of the carcass searches, a range of mitigation measures will have to be considered if mortality levels turn out to be significant.	

3.5.10 Social

Table 43: Social

IMPACT	**SOCIAL**	**RESPONSIBILITY**
PHASE	**OPERATION**	**Project Company**
ENVIRONMENTAL MANAGEMENT PROGRAMME		
	SITE SPECIFIC MITIGATION MEASURES	
MITIGATION	1. Links to new and existing local businesses to the supply chain of the wind farm should be made. 2. The most effective community structures are to be used for the trust fund, inclusion of existing structures, transparent rules in allocating funds, prioritisation according to community needs and building on existing regional synergies. 3. The impact on livelihoods will be monitored and evaluated as per the conditions of the Implementation Agreement.	

3.5.11 Noise

Table 44: Noise

IMPACT	**NOISE**	**RESPONSIBILITY**
PHASE	**OPERATION**	**Project Company**
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION	**Should any noise generating activities be required during the operation phase, mitigation measures will be undertaken in discussion with sensitive noise receptors and the Project Company where and if required.**	
	SITE SPECIFIC MITIGATION MEASURES	
MITIGATION	1. Quarterly noise monitoring must be conducted by an acoustic consultant for the first year of the operation of the wind farm. This monitoring must take place over a period of 24 hours in 10 minute bins, with the resulting data co-ordinated with wind speeds as measures at a 10 meter height. 2. Quarterly monitoring is recommended at NSD06 and NSD08 for the first year, as well as any other NSDs that have complained to the Project Company regarding noise originating from the facility. 3. Subsequent noise monitoring after the first year will only be carried out where further complaints are received after implementation of mitigation measures and it is agreed that monitoring is required by the Project Company and affected noise receptors. 4. Annual feedback regarding noise monitoring must be	

		presented to all stakeholders and other Interested and Affected Parties in the area. Noise monitoring must be continued as long as noise complaints are registered. The findings of this report must also be made available to all potentially noise sensitive development in the area, and the contents explained to them.	

3.6 Decommissioning phase

The mitigation measures presented below are of relevance to the decommissioning of the wind farm. Furthermore, mitigation measures implemented during construction with regards to the construction camp and equipment will remain the same for the decommissioning phase when a construction camp will need to be established again.

3.6.1 Ongoing Stakeholder Involvement

This is the process that is recommended when the proposed wind farms are decommissioned.

Table 45: Ongoing Stakeholder involvement

IMPACT	ONGOING STAKEHOLDER INVOLVEMENT	RESPONSIBILITY
PHASE	**DECOMMISSIONING**	**PROJECT COMPANY**
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION	1. Community to be notified, as culturally appropriate, timeously of the planned decommissioning, e.g.: ▪ Proposed decommissioning start date; and ▪ Process to be followed. 2. Recommend that a meeting with community leader(s) be held before decommissioning commence to inform them: ▪ What activities will take place during the decommissioning phase. ▪ How these activities will impact upon the communities and/or their properties. ▪ Regarding the timeframes of scheduled activities 3. Regular interaction between the Project Company and community leader(s) during the decommissioning phase 4. A reporting office / channel to be established should community members experience problems with contractors/ sub-contractors during the decommissioning phase. 5. A register to be kept of problems reported by community members and the steps taken to address / resolve it.	

3.6.2 Community health and safety

Table 46: Community health and safety

IMPACT	**COMMUNITY HEALTH AND SAFETY**	**RESPONSIBILITY**
PHASE	**DECOMMISSIONING**	**PROJECT COMPANY**
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION	1. Demarcated routes to be established for construction vehicles to ensure the safety of communities, especially in terms of road safety and communities to be informed of these demarcated routes. 2. Where dust is generated by trucks passing on gravel roads, dust mitigation to be enforced. 3. Any infrastructure that would not be decommissioned must be appropriately locked and/or fenced off to ensure that it does not pose any danger to the community.	

3.6.3 Waste Management

Table 47: Waste Management

IMPACT	**WASTE MANAGEMENT**	**RESPONSIBILITY**
PHASE	**DECOMMISSIONING**	**PROJECT COMPANY**
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION	1. All decommissioned equipment must be removed from site and disposed of at a registered land fill. Records of disposal must be kept.	

	2. Wind turbines must be recycled as much as possible. 3. All wind farm equipment above ground and foundations to a depth of 1 metre below natural ground level will be decommissioned to allow for farming activities to recommence throughout the site 4. The landowner will be consulted prior to decommissioning of site roads, and will be given the choice if any roads should remain.	

3.6.4 Surface and Groundwater

Table 48: Surface and Groundwater

IMPACT	**SURFACE AND GROUNDWATER**	**RESPONSIBILITY**
PHASE	**DECOMMISSIONING**	**PROJECT COMPANY**
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION	1. Removal of any historically contaminated soil as hazardous waste must be undertaken. 2. Removal of hydrocarbons and other hazardous substances by a suitable contractor to reduce contamination risks must be undertaken. 3. Removal of all substances which can result in groundwater (or surface water) contamination must be undertaken. 4. Re-vegetation of exposed soil surfaces to ensure no erosion in these areas is to be undertaken.	
	SITE SPECIFIC MITIGATION MEASURES	
	1. 2. Sanitary facilities must be available for workers (at a ratio of 1 toilet to	

	fifteen workers) to use to prevent urine and faecal waste entering the buffer zones of the wetlands and watercourses. Sanitary facilities must be placed at least 100m from the wetlands, watercourses and associated buffer zones. 3. Established internal access roads into watercourses and the associated buffer zones will need to be removed and rehabilitated. A site specific rehabilitation plan is to be formulated by a suitably qualified wetland or aquatic specialist and implemented addressing the removal of roads and associated stormwater structures from the watercourse and associated buffer zone areas. This will need to be approved by the relevant environmental determining authority. 4. All vehicles, materials and equipment must be stored at an established de-construction camp away from the watercourse and associated buffer zone areas. 5. The development and implementation of an adequate storm water management plan to be designed by an appropriate engineer will assist in formulating adequate measures to address any potential stormwater impacts from occurring. Here, the engineer should account for both natural run-off (that which can be released into the natural landscape with no detrimental effect) and excess artificial run-off generated over the exposed bare construction laydown areas. In order to prevent acceleration of stormwater run-off, energy dissipating structures can be used. Such structures can reduce the amount and rate of excess run-off generated by the proposed development entering wetlands and thereby prevent the onset of erosion. 6. Stormwater management structures or devices should also take into account the potential for sedimentation and siltation effects associated with stormwater run-off. In this instance, exposed bare areas should be	

	contained by silt fencing or other appropriate devices or materials to trap sediment and dissipate stormwater run-off.	

3.6.5 Biodiversity

Table 49: Biodiversity

IMPACT	**BIODIVERSITY**	**RESPONSIBILITY**
PHASE	**DECOMMISSIONING**	**PROJECT COMPANY**
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION	1. Rehabilitation of exposed surfaces with indigenous species. 2. Adherence to surface and groundwater mitigation measures to prevent secondary impacts on biodiversity 3. Prevention of expansion of current footprints	

3.6.6 Air Quality

Table 50: Air Pollution

IMPACT	**AIR POLLUTION**	**RESPONSIBILITY**
PHASE	**DECOMMISSIONING**	**PROJECT COMPANY**
ENVIRONMENTAL MANAGEMENT PROGRAMME		
MITIGATION	1. Regular maintenance of equipment to ensure reduced exhaust emissions	

4 MANAGEMENT PLANS REQUESTED BY DEA

4.1 Alien Invasive Management Plan

Table 51: Alien Invasive Management Plan

ALIEN INVASIVE MANAGEMENT PROGRAMME	
MITIGATION MEASURES	1. Stockpiles should be kept clear of weeds and alien vegetation growth by regular weeding. 2. Alien vegetation and the spread of exotic species on the site will need to be controlled. 3. The contractor should be responsible for implementing a programme of weed control (particularly in areas where soil has been disturbed); and grassing of any remaining stockpiles to prevent weed invasion. 4. Herbicide use shall only be allowed according to contract specifications. The application shall be according to set specifications and under supervision of a qualified technician. The possibility of leaching into the surrounding environment shall be properly investigated and only environmentally friendly herbicides shall be used. 5. The use of pesticides and herbicides on the site must be discouraged as these can impact on important pollinator species of indigenous vegetation. 6. Six monthly checks of the area should take place for the emergence of invader species. 7. Mitigation measures mentioned for the construction phase above must be implemented for any maintenance of the development that may be undertaken during the operation phase. 8. Correct rehabilitation with locally indigenous species. 9. Monitoring programme to ensure that rehabilitation efforts are successful to ensure that risks such as erosion, spread of exotic species and the edge effect are avoided. 10. Constant maintenance of the area to ensure re-colonisation of floral species. 11. Regular removal of alien species which may jeopardise the proliferation of indigenous species.

4.2 Plant Rescue Protection Plan

Table 52: Plant Rescue Protection Plan

PLANT RESCUE PROTECTION PLAN	
MITIGATION MEASURES	1. Vegetation removal must be limited to the wind farm construction site. 2. Vegetation to be removed as it becomes necessary rather than removal of all vegetation throughout the site in one step. 3. Materials should not be delivered to the site prematurely which could result in additional areas being cleared or affected. 4. No vegetation to be used for firewood. 5. Gathering of firewood, fruit, muti plants, or any other natural material onsite or in areas adjacent to the site is prohibited unless with prior approval of the ECO. 6. Only vegetation within the study area must be removed. 7. Vegetation removal must be phased in order to reduce impact of construction. 8. Construction site office and laydown areas must be clearly demarcated and no encroachment must occur beyond demarcated areas. 9. All natural areas impacted during construction must be rehabilitated with locally indigenous plant species. 10. A buffer zone should be established in areas where construction will not take place to ensure that construction activities do not extend into these areas. This must be clearly and visibly demarcated. 11. Construction areas must be well demarcated and these areas strictly adhered to. 12. The use of pesticides and herbicides in the study area must be discouraged as these impacts on important pollinator species of indigenous vegetation. 13. Soils must be kept free of petrochemical solutions that may be kept on site during construction. Spillage can result in a loss of soil functionality thus limiting the re-establishment of flora. 14. The grid access power line must span rocky areas in order to avoid transformation in these areas.

	15. Soil stockpiles must not become contaminated with oil, diesel, petrol, garbage or any other material, which may inhibit the later growth of vegetation in the soil. 16. Importantly, a permit for the relocation/removal and/or destruction of the following species (at the identified locations) as identified in the Noupoort Wind Farm Ecological Walk-through Report (Todd, 2014) is required before any of these listed and protected species can be affected by construction activities: *Pelargonium sidoides*; *Pelargonium abrotanifolium*; *Neohenricia sibbettii*; *Kniphofia ensifolia*; *Euphorbia clavarioides*; *Brunsvigia radulosa*

4.3 Re-Vegetation and Habitat Rehabilitation Plan

Table 53: Re-Vegetation and Habitat Rehabilitation Plan

RE-VEGETATION AND HABITAT REHABILITATION PLAN	
MITIGATION MEASURES	1. Re-vegetation should aim to accelerate the natural succession processes so that the plant community develops in the desired way, i.e. promote rapid vegetation establishment 2. Re-vegetation of disturbed surfaces should occur immediately after construction activities are completed. This should be done through seeding with indigenous grasses. 3. All damaged areas shall be rehabilitated upon completion of the contract 4. Re-vegetation of the disturbed site is aimed at approximating as near as possible the natural vegetative conditions prevailing prior to construction. 5. All natural areas impacted during construction must be rehabilitated with locally indigenous species typical of the representative botanical unit. 6. Rehabilitation must take place in a phased approach as soon as possible. 7. Rehabilitation process must make use of species indigenous to the area. Seeds from surrounding seed banks can be used for re-seeding. 8. Rehabilitation must be executed in such a manner that surface run-off will not cause erosion of disturbed areas. 9. Planting of indigenous tree species in areas not to be cultivated or built on must be encouraged.

	10. Habitat destruction should be limited to what is absolutely necessary for the construction of the infrastructure, including the construction of new roads. In this respect, the recommendations from the Ecological Specialist Study should be applied strictly. Personnel should be adequately briefed on the need to restrict habitat destruction, and must be restricted to the actual construction area. 11. Monitoring programme to ensure that rehabilitation efforts are successful to ensure that risks such as erosion, spread of exotic species and the edge effect are avoided.

4.4 Open Space Management Plan

Table 54: Open Space Management Plan

OPEN SPACE MANAGEMENT PLAN	
MITIGATION MEASURES	1. A buffer zone should be established in areas where construction will not take place to ensure that construction activities do not extend into these areas. 2. Vehicle movement should be restricted to authorised access roads 3. Before construction begins, all areas to be developed must be clearly demarcated with fencing or orange construction barrier where applicable. 4. All Construction Camps are to be fenced off in such a manner that unlawful entry is prevented and access is controlled. Signage shall be erected at all access points in compliance with all applicable occupational health and safety requirements. All access points to the Construction Camp should be controlled by a guard or otherwise monitored, to prevent unlawful access. 5. The contractor and ECO must ensure compliance with conditions described in the EA. 6. Records of compliance/ non-compliance with the conditions of the authorisation must be kept and be available on request. 7. Records of all environmental incidents must be maintained and a copy of these records be made available to provincial department on request throughout the project execution.

	8. Site establishment shall take place in an orderly manner and all required amenities shall be installed at camp sites before the main workforce move onto site. 9. All construction equipment must be stored within this construction camp. 10. An area for the storage of hazardous materials must be established that conforms to the relevant safety requirements and that provides for spillage prevention and containment 11. The Contractor must provide sufficient ablution facilities, in the form of portable / VIP toilets, at the Construction Camps, and shall conform to all relevant health and safety standards and codes. No pit latrines, French drain systems or soak away systems shall be allowed and toilets may not be situated within 100 meters of any surface water body or 1:100 year flood line. A sufficient number of toilets shall be provided to accommodate the number of personnel working in the area. 12. The Contractor shall inform all site staff to make use of supplied ablution facilities and under no circumstances shall indiscriminate sanitary activities be allowed. 13. No fires will be allowed and the Contractor must make alternative arrangements for heating. LP Gas may be used, provided that all required safety measures are in place. The Contractor shall take specific measures to prevent the spread of veld fires, caused by activities at the campsites. These measures may include appropriate instruction of employees about fire risks and the construction of firebreaks around the site perimeter. 14. Environmental awareness training for construction staff, concerning the prevention of accidental spillage of hazardous chemicals and oil; pollution of water resources (both surface and groundwater), air pollution and litter control and identification of archaeological artefacts. 15. Project manager shall ensure that the training and capabilities of the Contractor's site staff are adequate to carry out the designated tasks. 16. Staff should be educated as to the need to refrain from indiscriminate waste disposal and/or pollution of local soil and water resources and receive the necessary safety training. 17. Staff must be trained in the hazards and required precautionary measures for dealing with these substances

4.5 Erosion Management Plan

Table 55: Erosion Management Plan

EROSION MANAGMENT PLAN	
MITIGATION MEASURES	1. To prevent erosion, material stockpiled for long periods (2 weeks) should be retained in a bermed area. 2. Areas which are not to be constructed on within two months must not be cleared to reduce erosion risks. 3. The area to be cleared must be clearly demarcated and this footprint strictly maintained. 4. Spoil that is removed from the site must be removed to an approved spoil site or a licensed landfill site. 5. The necessary silt fences and erosion control measures must be implemented in areas where these risks are more prevalent. 6. Wind screening and stormwater control should be undertaken to prevent soil loss from the site. 7. The use of silt fences and sand bags must be implemented in areas that are susceptible to erosion. 8. Other erosion control measures that can be implemented are as follows: 9. Brush packing with cleared vegetation 10. Mulch or chip packing 11. Planting of vegetation 12. Hydroseeding / hand sowing 13. Sensitive areas need to be identified prior to construction so that the necessary precautions can be implemented. 14. All erosion control mechanisms need to be regularly maintained. 15. Seeding of topsoil and subsoil stockpiles to prevent wind and water erosion of soil surfaces. 16. Retention of vegetation where possible to avoid soil erosion 17. Vegetation clearance should be phased to ensure that the minimum area of soil is exposed to potential erosion at any one time.

	18. Re-vegetation of disturbed surfaces should occur immediately after construction activities are completed. This should be done through seeding with indigenous grasses. 19. No impediment to the natural water flow other than approved erosion control works is permitted. 20. To prevent stormwater damage, the increase in stormwater run-off resulting from construction activities must be estimated and the drainage system assessed accordingly. 21. Stockpiles not used in three (3) months after stripping must be seeded to prevent dust and erosion.

5 CONCLUSION

The environmental and social impacts of the project were identified through the four project phases (pre-construction, construction, operation and decommissioning). Both positive and negative project impacts were identified. The following section briefly describes some of the major impacts and proposed mitigation measures within each of the project phases.

5.1 Pre-Construction Phase

The first site activities before mobilization of equipment will be a survey, required for final design of wind farm foundations. There will be negative impacts on land associated with the construction of camps (temporary loss) and storage of construction materials, and foundations for the buildings (permanent loss) and wind turbines. Expectations of improvement in livelihood among locals should be addressed through public participation. Construction contracts will include environmental monitoring and management procedures and requirements. These must be in place prior to the commencement of any construction activities.

5.2 Construction Phase

This phase of the activity will have both positive and negative impacts. The positive impacts are employment opportunities offered to the construction workers and any other labourer who will be hired to provide their services during the construction phase. The negative impacts would include wastes generated, health and safety, air, dust and noise pollution, vegetation clearance, soil erosion, socio-environmental issues, loss of vegetation, and compaction of soil. Most of the negative impacts are minor and temporary and the significance of the impacts can be greatly reduced by the implementation of mitigation measures, which are outlined in this EMPr. The contractor shall ensure that all staff have adequate protective clothing and are adequately trained.

5.3 Operational Phase

The proposed project will have minimal negative effects which mainly relates to loss of aesthetic value and habitat. The habitat that will be lost is not regarded as pristine and therefore, is not viewed as significant. Most of the negative impacts are minor and the significance of the impacts can be greatly reduced by the implementation of mitigation measures, which are outlined in this

EMPr. Avifauna and bat post-construction Monitoring should be initiated to document the impact of the construction and operation phase on avifauna and bat activity on the site and the area surrounding the site.

5.4 Decommissioning Phase

As with any project, the facilities used in this project will have a lifetime after which they may no longer be cost effective to continue with operation. At that time, the project would be decommissioned, and the existing equipment removed.

Potential environmental impacts caused during decommissioning are those, which will be mitigated as provided by the Environmental Management Programme. These include: noise and emissions to the surrounding environment, removal of hazardous waste and substances, fire, oil spills, wastes and public safety.

The disposal of materials from the decommissioned plant is not viewed as high risk. Much of the material would be recyclable (steel structures and panels, turbine engines etc.) or inert (concrete foundations, etc.). These materials would however, need to be disposed off at a formal waste disposal or recycling centre.

Based on the above information, it is unlikely that the Project will have significant adverse social and environmental impacts. Most adverse impacts will be of a temporary nature during the construction phase and can be managed to acceptable levels with implementation of the recommended mitigation measures for the Project such that the overall benefits from the Project will greatly outweigh the few adverse impacts.

All the negative impacts will either be moderate or lesser in rating and could be easily mitigated.
Generally, the proposed wind farm will result in appreciable benefits to the people in the project area of influence and bring opportunities for development to the country.

Appendix A

Avi-fauna Walk-down Assessment

BIRD IMPACT ASSESSMENT

Walk-down assessment for Mainstream Noupoort Wind Energy Facility
132kV Grid Connection

MARCH 2014

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EXECUTIVE SUMMARY

This report primarily details the proposed mitigation for potential impacts on avifauna for the 132kV power line which will be constructed to connect the proposed Mainstream Noupoort Wind Energy Facility with the national grid. This walk-down report should be read in conjunction with the bird impact assessment study (February 2012) and avifaunal pre-construction monitoring report (February 2013) which was compiled for the proposed Mainstream Noupoort Wind Energy Facility near the town of Noupoort in the Northern Cape Province of South Africa. The report confirms the findings and suggested mitigation measures for the final turbine lay-out and associated infrastructure as detailed in the avifaunal impact assessment study and the avifaunal pre-construction monitoring report.

132kV GRID CONNECTION: CONCLUSIONS

The construction of the proposed new 132kV grid connection will pose a limited threat to the birds occurring in the vicinity of the new infrastructure. The power line poses a **medium** collision risk, but a **negligible** electrocution risk. With the implementation of appropriate mitigation measures, the collision risk could be reduced (but not eliminated). The habitat transformation and disturbance associated with the construction of the power line should have a **low** impact, provided the mitigation measures are strictly applied.

132kV GRID CONNECTION RECOMMENDATIONS:

<u>COLLISIONS WITH 132KV GRID CONNECTION</u>

- The following spans should be marked with Bird Flight Diverters on the earth wire of the line, ten metres apart, alternating black and white (see Figure 4 below):
    - Structures 16 – 17 (waterbirds)
    - Structures 30 – 50 (soaring species and Blue Cranes)

Appendix B indicates the preferred Bird Flight Diverters to be used.

<u>DISPLACEMENT BY 132KV GRID CONNECTION</u>

- It is important that the construction activities, vehicle and pedestrian movement are restricted a much as possible to the actual servitude of the proposed power line. Vehicle traffic in and out of the area should be restricted to what is absolutely necessary for the construction process. Maximum use should be made of existing roads.

TURBINE LAY-OUT AND ASSOCIATED INFRASTRUCTURE RECOMMENDATIONS:

Based on the results of the pre-construction monitoring, no relocation of specific turbines is recommended.

The following management actions are recommended:

<u>DISPLACEMENT</u>

- Formal monitoring should be resumed once the turbines have been constructed, as per best practice guidelines (Jenkins *et al* 2011). The purpose of this would be to establish if displacement of priority species has occurred and to what extent. The exact time when post-

construction monitoring should commence, will depend on the construction schedule, and will be agreed upon with Mainstream once these timelines have been finalised.
- The duration of the post-construction monitoring would need to be for at least an equivalent period to the pre-construction monitoring (four seasons), thereafter the need for additional monitoring will be determined and agreed to with Mainstream, based on the results of the first year of post-construction monitoring.
- A 500m buffer has already been implemented in the lay-out to accommodate the Blue Cranes that are breeding on the site. This should be strictly enforced as a no turbine zone for the duration of the project. In addition, no access roads should be constructed within that zone (see Figure 5).

COLLISIONS

- Formal monitoring should be resumed once the turbines have been constructed, as per best practice guidelines (Jenkins *et al* 2011) (see previous section Displacement). The purpose of this would be (a) to establish if displacement of priority species has occurred and to what extent through the altering of flight patterns post-construction, and (b) to search for carcasses at specific turbines.
- The environmental management plan should provide for the on-going inputs of a suitable experienced ornithological consultant to oversee the post-construction monitoring and assist with the on-going adaptive management of bird impacts that may emerge as the post-construction monitoring programme progresses. Depending on the results of the carcass searches, a range of mitigation measures will have to be considered if mortality levels turn out to be significant.

Chris van Rooyen
Chris has seventeen years' experience in the management of wildlife interactions with electricity infrastructure. He was head of the Eskom-Endangered Wildlife Trust (EWT) Strategic Partnership from 1996 to 2007, which has received international acclaim as a model of co-operative management between industry and natural resource conservation. He is an acknowledged global expert in this field and has worked in South Africa, Namibia, Botswana, Lesotho, New Zealand, Texas, New Mexico and Florida. Chris also has extensive project management experience and has received several management awards from Eskom for his work in the Eskom-EWT Strategic Partnership. He is the author of 15 academic papers (some with co-authors), co-author of two book chapters and several research reports. He has been involved as ornithological consultant in more than 100 power line and 25 wind generation projects. Chris is also co-author of the Best Practice for Avian Monitoring and Impact Mitigation at Wind Development Sites in Southern Africa, which is currently (2013) accepted as the industry standard. Chris also works outside the electricity industry and had done a wide range of bird impact assessment studies associated with various residential and industrial developments.

Albert Froneman (Pr.Sci.Nat)
Albert has an M. Sc. in Conservation Biology from the University of Cape Town, and started his career in the natural sciences as a Geographic Information Systems (GIS) specialist at Council for Scientific and Industrial Research (CSIR). He is a registered Professional Natural Scientist in the field of zoological science with the South African Council of Natural Scientific Professionals (SACNASP). In 1998, he joined the Endangered Wildlife Trust where he headed up the Airports Company South Africa – EWT Strategic Partnership, a position he held until he resigned in 2008 to work as a private ornithological consultant. Albert's specialist field is the management of wildlife, especially bird related hazards at airports. His expertise is recognized internationally; in 2005 he was elected as Vice Chairman of the International Bird Strike Committee. Since 2010, Albert has worked closely with Chris van Rooyen in developing a protocol for pre-construction monitoring at wind energy facilities, and they are currently jointly coordinating pre-construction monitoring programmes at several wind farm facilities. Albert also works outside the electricity industry and had done a wide range of bird impact assessment studies associated with various residential and industrial developments.

DECLARATION OF INDEPENDENCE
I, Chris van Rooyen as duly authorised representative of Chris van Rooyen Consulting, and working under the supervision of and in association with Albert Froneman (SACNASP Zoological Science Registration number 400177/09) as stipulated by the Natural Scientific Professions Act 27 of 2003, hereby confirm my independence (as well as that of Chris van Rooyen Consulting) as a specialist and declare that neither I nor Chris van Rooyen Consulting have any interest, be it business, financial, personal or other, in any proposed activity, application or appeal in respect of which Aurecon was appointed as environmental assessment practitioner in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), other than fair remuneration for worked performed, specifically in connection with the Basic Assessment for the proposed Mainstream Noupoort 132kV Grid Connection.

Chris van Rooyen

Full Name: Chris van Rooyen
Title / Position: Director
Experience: 17 years

1. INTRODUCTION & BACKGROUND

This report primarily details the proposed mitigation for potential impacts on avifauna for the 132kV power line which will be constructed to connect the proposed Mainstream Noupoort Wind Energy Facility with the national grid. This walk-down report should be read in conjunction with the bird impact assessment study (February 2012) and avifaunal pre-construction monitoring report (February 2013) which was compiled for the proposed Mainstream Noupoort Wind Energy Facility near the town of Noupoort in the Northern Cape Province of South Africa. The report confirms the findings and suggested mitigation measures for the final turbine lay-out and associated infrastructure as detailed in the avifaunal impact assessment study and the avifaunal pre-construction monitoring report.

The Noupoort Wind Farm will have a capacity of 80MW and will consist of 35 wind turbines. The wind turbines will have a hub height of up to 120m. The rotor diameter will be up to 120m. The wind turbines will not be fixed and will be able to rotate to catch prevailing winds. The foundation of each wind turbine will be approximately 20m x 20m. The footprint for each wind turbine will therefore be approximately 400m². A hard standing area, of approximately 2 400m², for crane usage will accompany each wind turbine. Hence, the total footprint for each wind turbine and the associated hard standing area will be approximately 2 800m². The foundation will be up to approximately 2.5m deep. The wind turbines will be connected by underground cabling (approximately 1m deep) except where the cable cannot be buried. In this instance an overhead power line will be used. To connect the wind farm to the national electricity grid, a 132kV overhead power line will be constructed that will route from the substation on site towards the south west where it will tie into an existing 132kV overhead power line that routes into Noupoort. The power line will be approximately 13km in length. A substation will be constructed on the wind farm site which will occupy an area of 100m x 100m (approximately 10 000m²). An access road will be constructed that will be 6-10m wide. The roads will be gravel roads and will include turning circles for large trucks and passing points A temporary lay-down area is to be established which will be approximately 5 000m² (including an access route and contractor's site). Other infrastructure will include an administration and warehouse building that will occupy an area of up to 5 000m².

See Figures 1, and 2 below for maps of the study area:

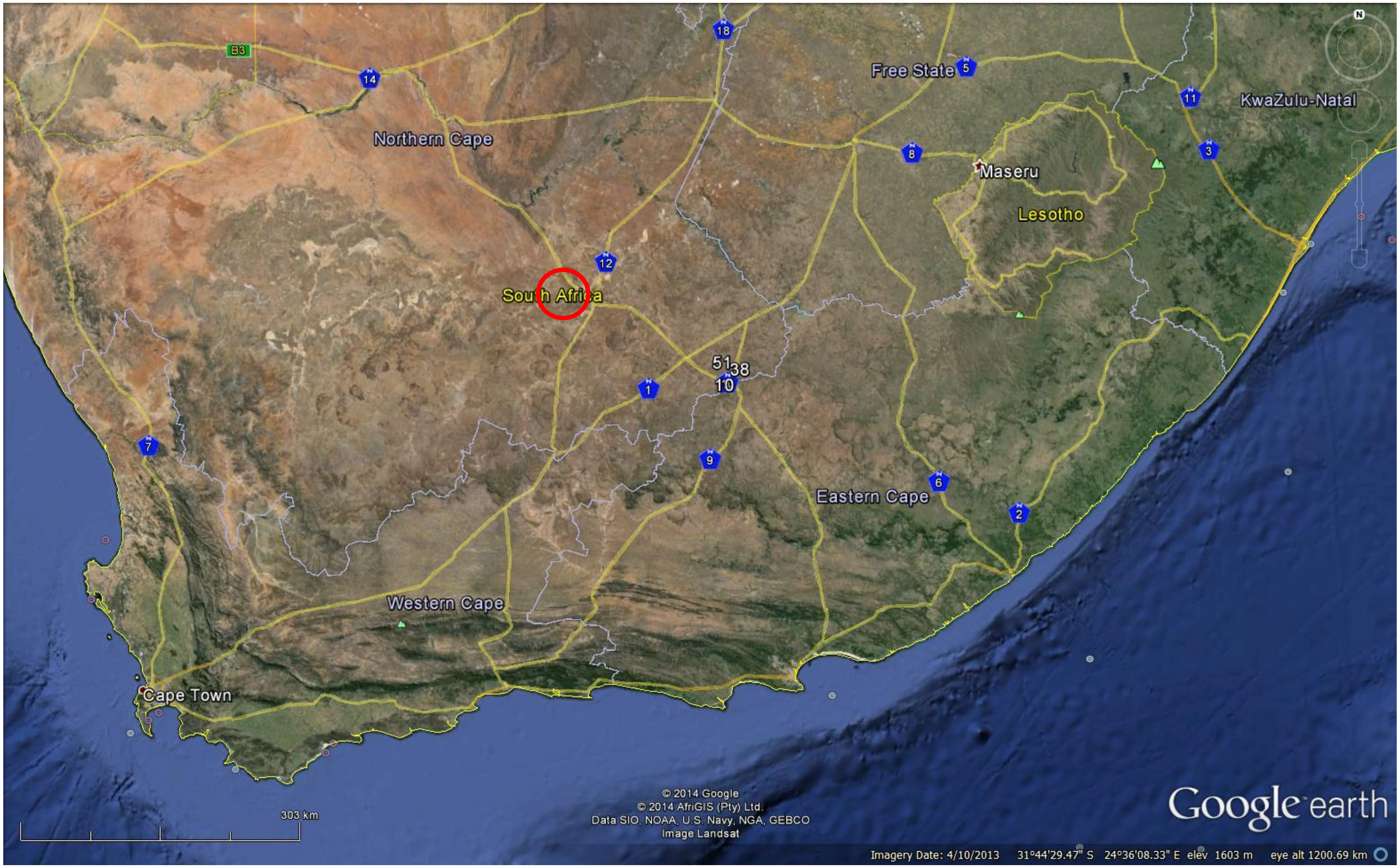

Figure 1: Map showing locality of the study area.

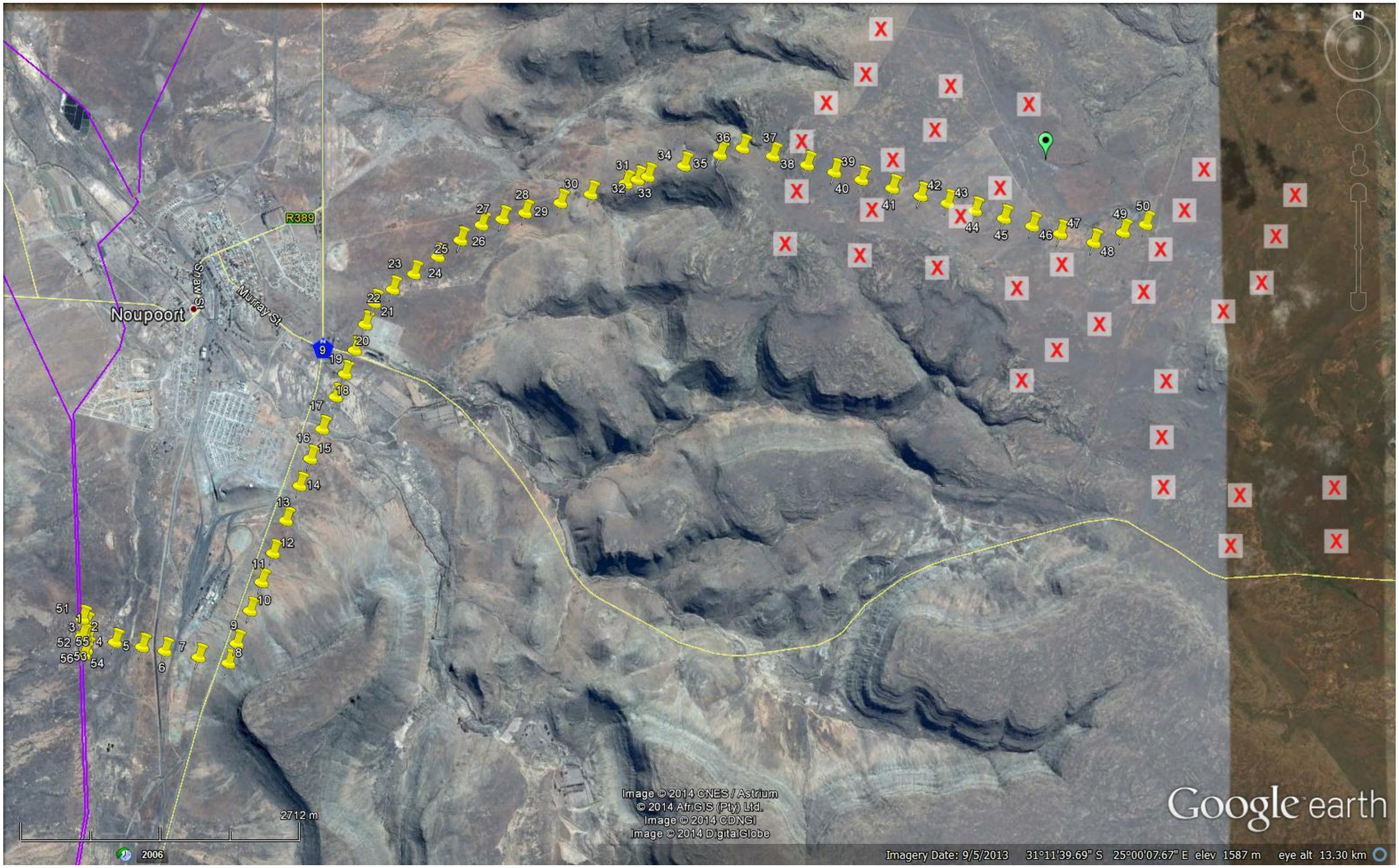

Figure 2: A closer view of the proposed 132kV tower positions (yellow placemarks), together with existing transmission lines (purple lines), turbine positions (red crosses) and Blue Crane nest (green placemark).

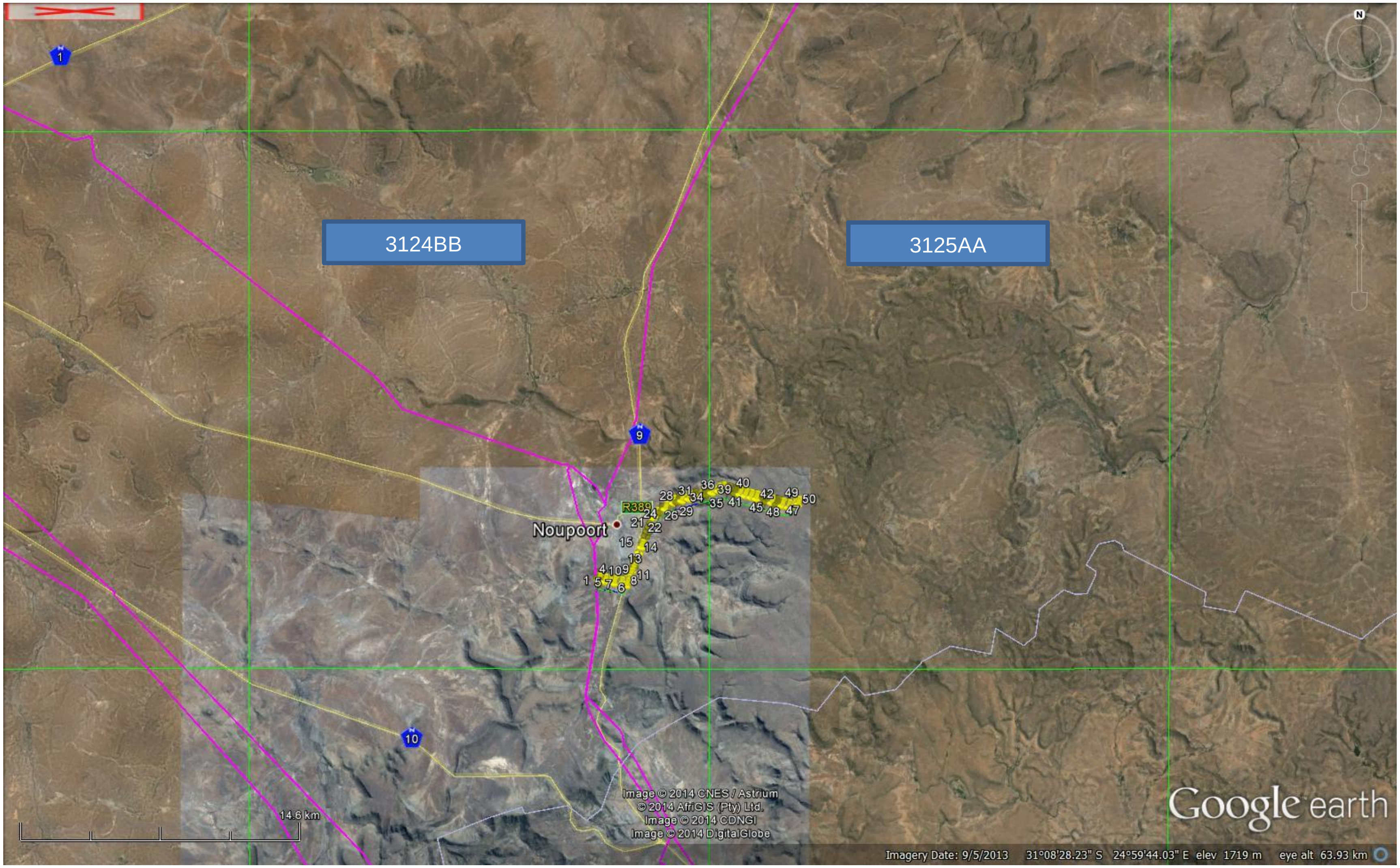

Figure 3: The location of the study area within the 3124BB and 3125AA quarter degree grid cells.

The terms of reference for the walk-down report are as follows:

- Describe the affected environment.
- Indicate how birdlife will be affected by the proposed 132kV grid-connection.
- Discuss gaps in baseline data.
- List the expected impacts.
- Recommend relevant mitigation measures for the 132kV grid connection.
- Revisit the mitigation measures recommended in the bird impact assessment study (February 2012) and avifaunal pre-construction monitoring report (February 2013) for the turbine lay-out and associated infrastructure.

2. SOURCES OF INFORMATION

The following information sources were consulted in order to conduct this study:

- Bird distribution data of the Southern African Bird Atlas Project 2 (SABAP2)(http://sabap2.adu.org.za) was obtained for the quarter-degree grid cells (GDGC = the equivalent of a 1:50 000 map) where the study area (defined as a 2km radius around all the potential alignments and substation sites) is located, namely 3124BB and 3125AA.
- The conservation status of all species considered likely to occur in the study area was determined as per the most recent iteration of the southern African Red Data list for birds (Taylor 2014), and the most recent and comprehensive summary of southern African bird biology (Hockey *et al.* 2005).
- The author has travelled and worked extensively on power line and wind energy projects in the Northern Cape Province since 1996. Personal observations of avifauna and bird/habitat associations, have therefore also been used to supplement the data that is available from SABAP2.
- The power line bird mortality incident database of the Eskom - Endangered Wildlife Trust Strategic Partnership (1996 to 2008) was consulted to determine which of the species occurring in the study area are typically impacted upon by power lines and the extent to which they are impacted on (Jenkins *et al.* 2010).
- A classification of the vegetation types in the QDGC was obtained from the Southern African Bird Atlas Project 1 (SABAP1, Harrison *et al.* 1997), and the Vegetation map of South Africa (Mucina & Rutherford 2006).
- Information on the micro habitat level was obtained through the field work that was conducted for the bird impact assessment study in 2012 and pre-construction monitoring in 2011/2012.

2.1 Assumptions & Limitations

The following assumptions and limitations are applicable in this study:

- In this instance the 3124BB and 3125AA QDGCs were well covered by SABAP2, with data recorded on a combined 38 checklists to date. The reporting rates were therefore treated as a reasonably accurate measure of the potential presence of a specific species. Reliance was also placed on professional judgment and previous field work in the area.
- Conclusions in this study are based on experience of these and similar species in different parts of South Africa. Bird behaviour can never be entirely reduced to formulas that will hold true under all circumstances. However, power line and substation impacts can be predicted with a fair amount of certainty (see References Section 8).
- It is important to note that, although the envisaged impacts are mostly concerned with Red Data species, the non-Red Data species will benefit as much from the proposed mitigation

measures as they share the same habitat and face the same potential impacts as the Red Data species.

3. AVIFAUNA

3.2 Bird populations

A total of 131 species were recorded in 3124BB by SABAP2, with 8 classified as Red Data species. For 3125AA the count is 149 species including 8 Red Data species. Reporting rates are an indication of the relative density of a species on the ground in that it reflects the number of times that a species was recorded relative to the total amount of cards that were completed for the square.

Table 1 provides a guideline of the species that could potentially be encountered in the study area and the habitat type where they are most likely to be found. The potential of the proposed infrastructure impacting negatively on the species (displacement and collisions) are also covered.

TABLE 1: Species of conservation concern potentially occurring in the study area, and potential impacts on these species by the proposed 132kV grid connection.

NT = Near threatened
VU = Vulnerable
EN = Endangered

Name	Scientific name	Conservation status (Taylor 2014)	Grassy Karoo	Ridges and mountains	Waterbodies	Agricultural lands	Collisions	Displacement through disturbance	Displacement through habitat destruction
Blue Crane	*Anthropoides paradiseus*	NT	x	-	x	x	x	x	-
Lanner Falcon	*Falco biarmicus*	VU	x	x	x	x	x	-	-
Ludwig's Bustard	*Neotos ludwigii*	EN	x	-	-	x	x	-	-
Martial Eagle	*Polemaetus bellicosus*	EN	x	-	x	-	x	-	-
African Rock Pipit	*Anthus crenatus*	NT	-	x	-	-	-	-	-
Verreaux's Eagle	*Aquila verreauxii*	VU	-	x	-	-	x	-	-
Karoo Korhaan	*Eupodotis vigorsii*	NT	x	-	-	-	x	-	-
Black Stork	*Ciconia nigra*	VU	-	x	x	-	x	-	-
Greater Flamingo	*Phoenicopterus ruber*	NT	-	-	x	-	x	-	-
Double-banded Courser	*Rhinoptilus africanus*	NT	x	-	-	-	-	-	-

3.3 Biomes and bird habitats

From a botanical perspective, the natural vegetation type in the study area is a mixture of Karoo Escarpment Grassland, Tarkastad Montane Grassland and Eastern Upper Karoo (Mucina & Rutherford 2006). However, it is generally accepted that vegetation structure, rather than the actual plant species, most influences bird species distribution and abundance (Harrison *et al.* 1997). Therefore, the habitat descriptions used in this report does not focus on lists of plant species, but rather on factors which are relevant to bird distribution. The description of the vegetation types are largely based on the classification system used in the Atlas of Southern African Birds (SABAP1) (Harrison *et al.* 1997). From an avifaunal perspective, SABAP1 recognises six primary vegetation divisions (biomes) within South Africa, namely (1) Fynbos (2) Succulent Karoo (3) Nama Karoo (4) Grassland (5) Savanna and (6) Forest (Harrison *et al.* 1997). The criteria used by the atlas authors to amalgamate botanically defined vegetation units, or to keep them separate were (1) the existence of clear differences in vegetation structure, likely to be relevant to birds, and (2) the results of published community studies on bird/vegetation associations. According to the SABAP1 classification system, the study area is located in an ecological transitional zone between the Nama Karoo and Grassland biomes (Harrison *et al*. 1997).

The following bird habitats have been identified in the study area:

3.3.1 Grassy Karoo

Grassy Karoo can be viewed as an ecological transition zone between the Nama Karoo and Grassland biomes; although also primarily a dwarf-shrub habitat, it shows higher proportions of grass and in places, tree cover, than typical Nama Karoo. The Karoo vegetation types support a remarkably high diversity of bird species endemic to Southern Africa, particularly in the family *Alaudidae* (Larks). Its avifauna typically comprises ground-dwelling species of open habitats. Many typical Karoo species are nomads, able to use resources that are patchy in time and space (Barnes 1998). Power line sensitive Red Data species that are associated with Grassy Karoo habitat in the study area are Ludwig's Bustard, Martial Eagle, Blue Crane, Karoo Korhaan, Double-banded Courser and Lanner Falcon**. The major potential impact in this habitat is collisions with the earthwire of the proposed power line, particularly for Blue Crane, as there is a nest situated 800m from the proposed power line. Disturbance is also a potential impact due to the proximity of the Blue Crane nest, but this can be avoided provided appropriate mitigation measures are strictly applied (see Figure 2) and section 7 below.**

3.3.2 Waterbodies and drainage lines

The study area contains a number of man-made water bodies and ephemeral drainage lines which are of specific importance to some Red Data power line sensitive species in the semi-arid study area e.g. between structures 16 – 17 and 30 - 31. Occasionally, after good rains when pools form in the channels, it could act as a draw card for waterbirds, including Black Stork. During such times, small birds are attracted to the water, which in turn may attract Lanner Falcons and other raptors. Man-made dams attract a multitude of water birds, including Greater Flamingo, and could sometimes be used as roosts by Blue Cranes. Dams with shallow sloping sides are also important for large raptors e.g. Martial Eagle and Verreaux's Eagle, for bathing and drinking. **The major potential impact for the aforementioned power line sensitive Red Data species is collisions with the earthwire of the proposed lines.**

3.3.3 Ridges and mountains

The study area contains several ridges with boulder strewn slopes and low cliffs, between structures 30 - 36. This habitat is potentially important roosting, foraging and breeding habitat for a variety of Red Data power line sensitive species, e.g. Black Stork, Lanner Falcon, Verreaux's Eagle and African Rock Pipit. It is not envisaged that the line will pose any threat to the African Rock Pipit, but a potential impact on the larger species is **collisions with the proposed power line, and displacement of breeding birds due to disturbance.**

3.3.4 Agriculture

The study area contains very few agricultural lands, because the land is used mostly for livestock grazing. However there are a few agricultural lands, between structures 47 - 50. Agricultural lands completely destroy the structure of the original vegetation, but some birds do benefit from this transformation. Blue Crane and Ludwig's Bustard are the Red Data species most likely to utilise agricultural lands in the study area. **The major potential impact in this habitat is collisions with the earthwire of the proposed power line, particularly for Blue Crane.**

3.3.6 Low impact areas

The study area contains habitat which would generally not attract power line sensitive Red Data species. These are industrial areas and urban areas around Noupoort. **No significant impacts on power line sensitive Red Data species are expected in these areas.**

Examples of the habitat in the study area are presented in APPENDIX A.

6 CONCLUSIONS

The construction of the proposed new 132kV grid connection will pose a limited threat to the birds occurring in the vicinity of the new infrastructure. The power line poses a **medium** collision risk, but a **negligible** electrocution risk. With the implementation of appropriate mitigation measures, the collision risk could be reduced (but not eliminated). The habitat transformation and disturbance associated with the construction of the power line should have a **low** impact, provided the mitigation measures are strictly applied.

7 RECOMMENDATIONS

7.1 Collisions with 132kV grid connection

- The following spans should be marked with Bird Flight Diverters on the earth wire of the line, ten metres apart, alternating black and white (see Figure 4 below):
    - Structures 16 – 17 (waterbirds)
    - Structures 30 – 50 (soaring species and Blue Cranes)

Appendix B indicates the preferred Bird Flight Diverters to be used.

Figure 4: The sections of 132kV line that requires marking with BFD's.

7.2 Displacement by 132kV grid connection

- It is important that the construction activities, vehicle and pedestrian movement are restricted a much as possible to the actual servitude of the proposed power line. Vehicle traffic in and out of the area should be restricted to what is absolutely necessary for the construction process. Maximum use should be made of existing roads.

7.3 Turbine lay-out and associated infrastructure

Based on the results of the pre-construction monitoring, no relocation of specific turbines is recommended.

The following management actions are recommended:

<u>DISPLACEMENT</u>

- Formal monitoring should be resumed once the turbines have been constructed, as per best practice guidelines (Jenkins *et al* 2011). The purpose of this would be to establish if displacement of priority species has occurred and to what extent. The exact time when post-construction monitoring should commence, will depend on the construction schedule, and will be agreed upon with Mainstream once these timelines have been finalised.
- The duration of the post-construction monitoring would need to be for at least an equivalent period to the pre-construction monitoring (four seasons), thereafter the need for additional monitoring will be determined and agreed to with Mainstream, based on the results of the first year of post-construction monitoring.
- A 500m buffer has already been implemented in the lay-out to accommodate the Blue Cranes that are breeding on the site. This should be strictly enforced as a no turbine zone for the duration of the project. In addition, no access roads should be constructed within that zone (see Figure 5).

<u>COLLISIONS</u>

- Formal monitoring should be resumed once the turbines have been constructed, as per best practice guidelines (Jenkins *et al* 2011) (see previous section Displacement). The purpose of this would be (a) to establish if displacement of priority species has occurred and to what extent through the altering of flight patterns post-construction, and (b) to search for carcasses at specific turbines.
- The environmental management plan should provide for the on-going inputs of a suitable experienced ornithological consultant to oversee the post-construction monitoring and assist with the on-going adaptive management of bird impacts that may emerge as the post-construction monitoring programme progresses. Depending on the results of the carcass searches, a range of mitigation measures will have to be considered if mortality levels turn out to be significant.

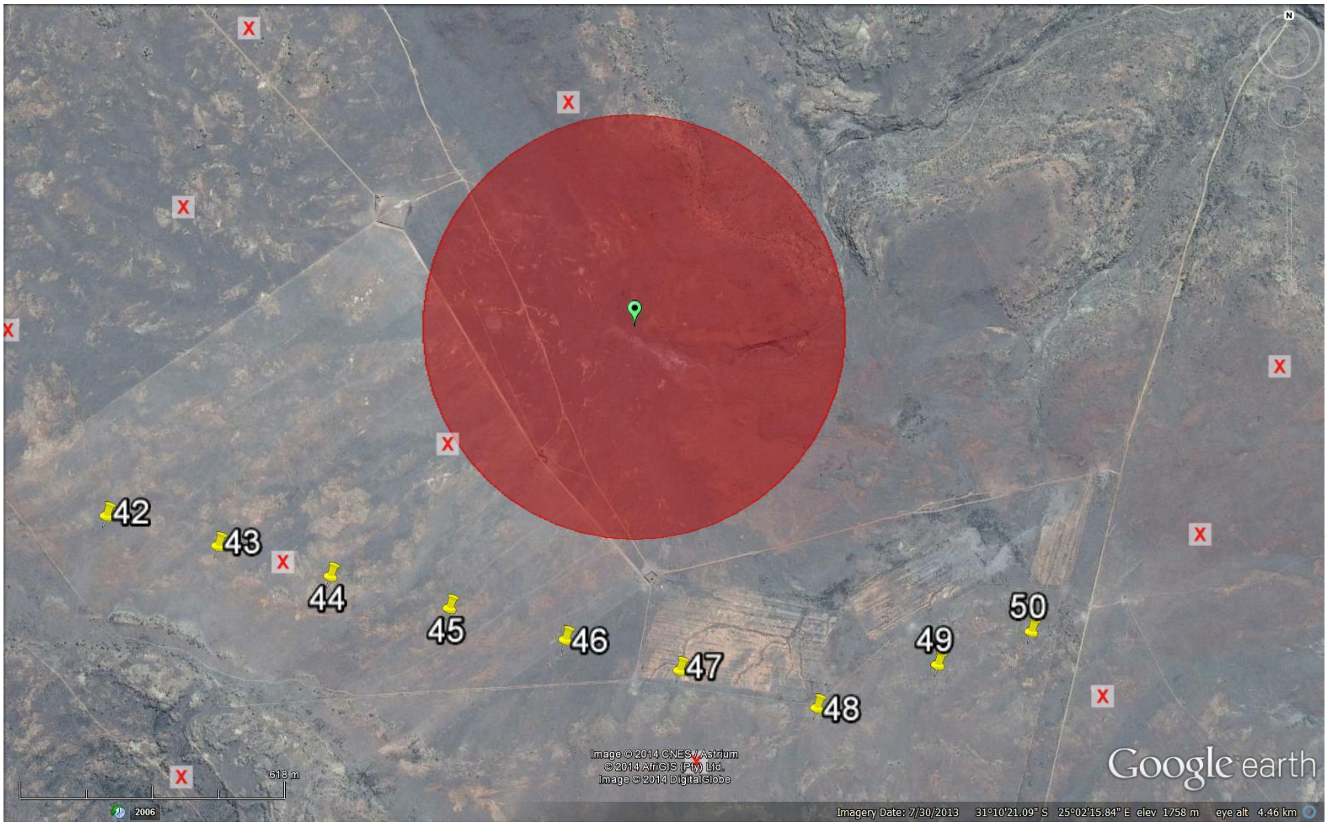

Figure 5: 500m buffer zone around the Blue Crane nest (green placemark).

8 REFERENCES

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Hockey P.A.R., Dean W.R.J., And Ryan P.G. 2005. *Robert's Birds of Southern Africa, seventh edition*. Trustees of the John Voelcker Bird Book Fund, Cape Town.

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Mucina. L. & Rutherford, M.C. (Eds) 2006. The vegetation of South Africa, Lesotho and Swaziland. *Strelitzia* 19. South African National Biodiversity Institute, Pretoria.

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Taylor, M.R. (ed.) 2014. The Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland. BirdLife South Africa, Johannesburg. In press.

APPENDIX A: BIRD HABITAT

Figure 1: Typical Grassy Karoo.

Figure 2: An ephemeral drainage line.

Figure 3: Rocky ridges and slopes.

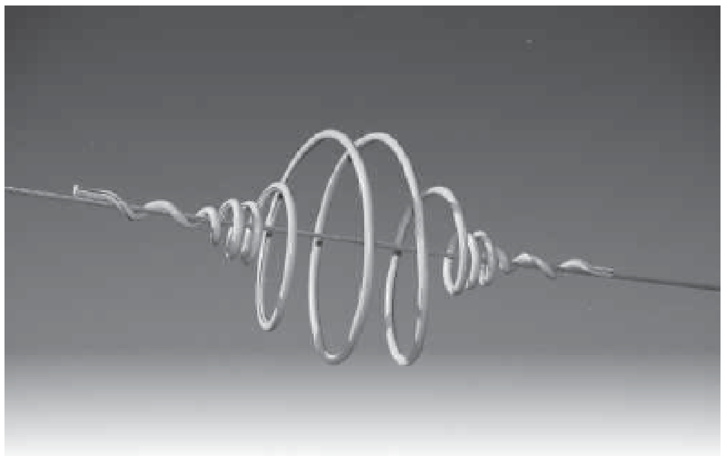
Figure 4: A dam.

Figure 5: Agriculture

APPENDIX B: PREFERRED BIRD FLIGHT DIVERTER

PLP – The connection you can count on

Double Loop Bird Flight Diverter



General Recommendation

The Bird Flight Diverter is designed to make overhead lines visible to birds and provides and economic means of reducing the hazard to both lines and birds. For low and medium voltage construction (up to 40kV) it is applied to the phase conductors (bare or jacketed). For high voltage it is used on the earth wire.

The fitting is light in weight, offers little wind resistance and is easily and quickly applied. The positive grip of the fitting on the conductor ensures that it remains in the applied position and cannot move along the span under vibration.

Visibility: The diverter section increases the visibility profile of the cable or conductor to a degree necessary to ensure safety, but avoids undesirably bulky outline.

Spacing: Spacing distances are not critical and will depend upon local conditions. Since wind resistance is very limited, sufficient fittings can be used to ensure adequate visibility without creating stresses on the line. When marking adjacent spans, overall visibility is improved by staggering the application.

We recommend generally a spacing of 10 or 15 metres.

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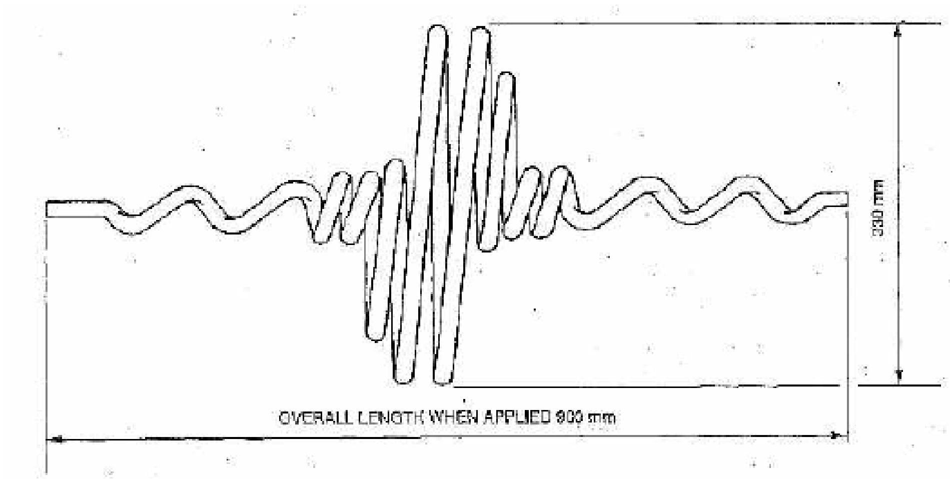
PLP – The connection you can count on

Double Loop Bird Flight Diverter



Material Used: Manufactured from rigid solid high impact polyvinyl chloride, possessing excellent chemical and strength properties and which will retain good physical characteristics within the range of extreme temperatures. Outdoor aging tests indicate that the material does not deteriorate in function or appearance from the effects of severe weather conditions. Industrial fumes and salt water cannot seriously degrade the properties of rigid PVC.

Colour: White or Black

Lay Direction: Bird Flight Diverters are supplied right hand lay for both right hand and left hand lay bare conductors and insulated cables.

CATALOGUE NO.	CONDUCTOR/ E/WIRE DIA. RANGE
BFD 0914/LD2*	9 mm – 14 mm

*Add B or W to denote colour

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Appendix B

Biodiversity Walk-down Assessment

MAINSTREAM NOUPOORT WIND ENERGY FACILITY:

FAUNA AND FLORA PRECONSTRUCTION WALK-THROUGH REPORT

SiVEST

PRODUCED FOR SiVEST

ON BEHALF OF

MAINSTREAM RENEWABLE POWER

MAINSTREAM RENEWABLE POWER SOUTH AFRICA

SIMON TODD CONSULTING

Simon.Todd@3foxes.co.za

MARCH 2014

DECLARATION OF CONSULTANTS' INDEPENDENCE

- I Simon Todd, as the appointed independent specialist hereby declare that I:
- act/ed as the independent specialist in this application;
- regard the information contained in this report as it relates to my specialist input/study to be true and correct, and
- do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2010 and any specific environmental management Act;
- have and will not have no vested interest in the proposed activity proceeding;
- have disclosed, to the applicant, EAP and competent authority, any material information that have or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the NEMA, the Environmental Impact Assessment Regulations, 2010 and any specific environmental management Act;
- am fully aware of and meet the responsibilities in terms of NEMA, the Environmental Impact Assessment Regulations, 2010 (specifically in terms of regulation 17 of GN No. R. 543) and any specific environmental management Act, and that failure to comply with these requirements may constitute and result in disqualification;
- have provided the competent authority with access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not; and
- am aware that a false declaration is an offence in terms of regulation 71 of GN No. R. 543.

Simon Todd Pr.Sci.Nat 400425/11.

March 2014

Introduction & Background

Sivest Environmental Division has been contracted by Mainstream South Africa to meet the preconstruction requirements for the approved Noupoort Wind Energy Facility located in the Northern Cape. As part of the preconstruction conditions as contained within the environmental authorization for the development, a preconstruction walk-through of the facility by an ecologist is required. In order to meet this requirement, Sivest have appointed Simon Todd Consulting to provide the walk-through.

The purpose of the walk-through is to locate and identify any species or habitats of conservation concern which lie within the development footprint and which may be impacted by the preconstruction activities. In such circumstances, the information provided can be used to comply with the permit conditions with regards to any listed or protected species that may be present within the development footprint, or specific recommendations may be made with regards to translocating certain species or individuals within the footprint or where significant unavoidable impacts are identified, minor adjustment to the footprint locations may be recommended.

The terms of reference for the walk-through are outlined in broad terms as follows:

- Conduct a walk-through of the turbine positions and turbine access roads.
- Conduct a walk-through of the power line route.
- Conduct a walk-though of the associated infrastructure such as the on-site substation, admin and workshop buildings.
- Provide a walk-through report detailing any sensitive faunal or flora habitats, active animal burrows or listed or protected flora within the development footprint, with coordinates of affected plants, photographs and descriptions of sensitive features and recommendations as required with regards to relocating infrastructure within sensitive environments.

Relevant Aspects of the Development

Figure 1. Satellite image illustrating the layout of the Noupoort Wind Energy Facility, with power line in red, existing roads in green, new turbine access roads in yellow and laydown area, substation and control buildings in blue.

The layout of the facility is illustrated above in Figure 1 and comprises 35 wind energy turbines as well as approximately 50km of new turbine access roads, an on-site substation, a laydown area as well as admin and maintenance buildings. The power line from the on-site substation to the proposed connection point is 13.2km long and connects to the Eskom grid west of the N9, south of Noupoort.

Walk-Through

The walk-through was conducted over three days from the 20th – 22nd of March 2014. Over the course of the walk-through the whole development footprint was walked which included all access roads, turbine foundation sites and service areas as well as the maintenance building and substation site, the laydown area and the power line. The search track that was generated over the three days was 75.6 km long, which includes some sections that had to be walked twice or which were not in the footprint but which had to be covered in order to return to the starting location. No records of listed or protected species from outside the development are however included in the assessment and only those potentially affected by the development are reported here.

During the walk-through all protected and listed species within or near the infrastructure were noted and their location recorded with a GPS. Although the access roads are planned to be 6m wide, the centreline of the roads were used as the reference for the walk-through and all species within 10m either side of the centreline were recorded, giving rise to a corridor with a minimum width of 20m which has been checked. Apart from the roads, specific attention was also paid to searching the turbine locations with associated service area and crane pads.

Identification of Listed and Protected Species

Plant species of conservation concern which may occur in the area were identified a priori as far as possible, based on a species list for the broad area extracted from the SANBI SIBIS database for the quarter degree squares 3124 BB and BD and 3125 AA and AC. Species of conservation concern were extracted from the list based on their status according to Red List of South African plants version 2013.1 (http://redlist.sanbi.org/) as well as species listed as endangered or protected under the Northern Cape Nature Conservation Bill of 2009. In some cases species are listed under both, but in general the provincial legislation is more inclusive and attempts to provide some protection for species, genera and families likely to vulnerable to illegal plant collection and other similar threats. Of particular relevance to the current study are the following, which are extracted from the legislation and are not intended to provide a comprehensive list of all protected species, only those which are likely to be encountered in the area. The reader is referred to the schedules of the Act for a full list of species listed under the act.

Schedule 1: Specially Protected Flora

- Family GERANIACEAE - Pelargonium spp. all species

Schedule 2 Protected Flora

- *Amaryllidaceae* – All species
- *Apiaceae* – All Species
- *Apocynaceae* – All Species
- *Asphodelaceae* – All species except Aloe ferox
- *Iridaceae* – All species
- *Mesembryanthemaceae* – All species
- *Crassulaceae* - All species except those listed in Schedule 1
- *Euphorbiaceae* - Euphorbia spp. All species
- *Oxalidaceae* - Oxalis spp All species
- *Portulacaceae* - Anacampseros spp. All species

In terms of fauna the following are species which potentially occur at the site and are listed as protected species:

Schedule 1. Specially Protected Fauna

- *Felis nigripes* - Black-footed cat/Miershooptier
- *Felis silvestris* - African wild cat/Afrika wildekat
- *Ictonyx striatus* - Striped polecat/Stinkmuishond
- *Mellivora capensis* - Honey badger/Ratel
- *Otocyon megalotis* - Bat-eared fox/Bakoorvos
- *Proteles cristatus* – Aardwolf/Maanhaarjakkals
- *Vulpes chama* - Cape fox / Silver jackal Silwervos
- *Orycteropus afer* - Aardvark / Ant-bear Erdvark / Aardvark
- Family: *Chamaeleonidae* - Chamaeleons, all species

- Family: *Cordylidae* Girdled lizards, all species
- *Cacosternum capense* Cape Caco / Kaapse blikslanertjie
- *Pyxicephalus adspersus* Giant Bullfrog / Brulpadda

Schedule 2. Protected Species

Virtually all indigenous fauna which do not fall under Schedule 1 are classified under Schedule 2, except those species classified as pests. In terms of mammals most rodents, shrews, elephant shrews, bats, hares and rabbits, carnivores such as mongoose, genets, and meerkat, antelope such as klipspringer, steenbok and duiker are included. In terms of other vertebrates, all tortoises, lizards, most harmless snakes and all frogs are listed under Schedule 2. The full list is contained within the Schedule and it not repeated here.

In terms of fauna, the following *inter alia* are protected and may not be hunted, captured or harmed without a permit:

- All tortoises
- All lizards
- All frogs
- Most snakes
- All indigenous antelope
- Aardvark
- Most small carnivores such as Honey Badger, Cape Fox, Bat-eared Fox, Large Grey Mongoose etc.
- Most birds except pest species

Or relevance to the current study would be burrows of any of the above species within the development footprint, specialized habitat or home to red-listed fauna, or nesting and roosting sites of birds such as raptors or cranes.

Study Limitations

Rainfall prior to the walk-through had been relatively good and the majority of the vegetation was in a relatively green, growing state. As a result, the majority of species were visible and could be identified and the timing of the walk-through is not seen to impose any significant limitations on the study. It is however important to recognise that some of the protected species which are present are small or cryptic and it is not likely that all of the individuals of such species can be located during a walk-through. Nevertheless, the density of such species can be used to identify areas of high sensitivity and provide an estimate of the number of individuals affected where counts are not deemed reliable. In addition, as entire genera or even families are protected, there may be common species present at the site from such genera, but which have not been individually recorded as they are among the dominant species present and it would not be possible to individually record such species as there may be tens of thousands of individuals of such species within the development footprint. However, as such species are not of conservation concern, this is not an important limitation, but such species are identified in the study in order to ensure compliance with the provincial legislation and permit requirements. All protected species observed at the site are listed in an Annex to this report.

Walk-Through Results

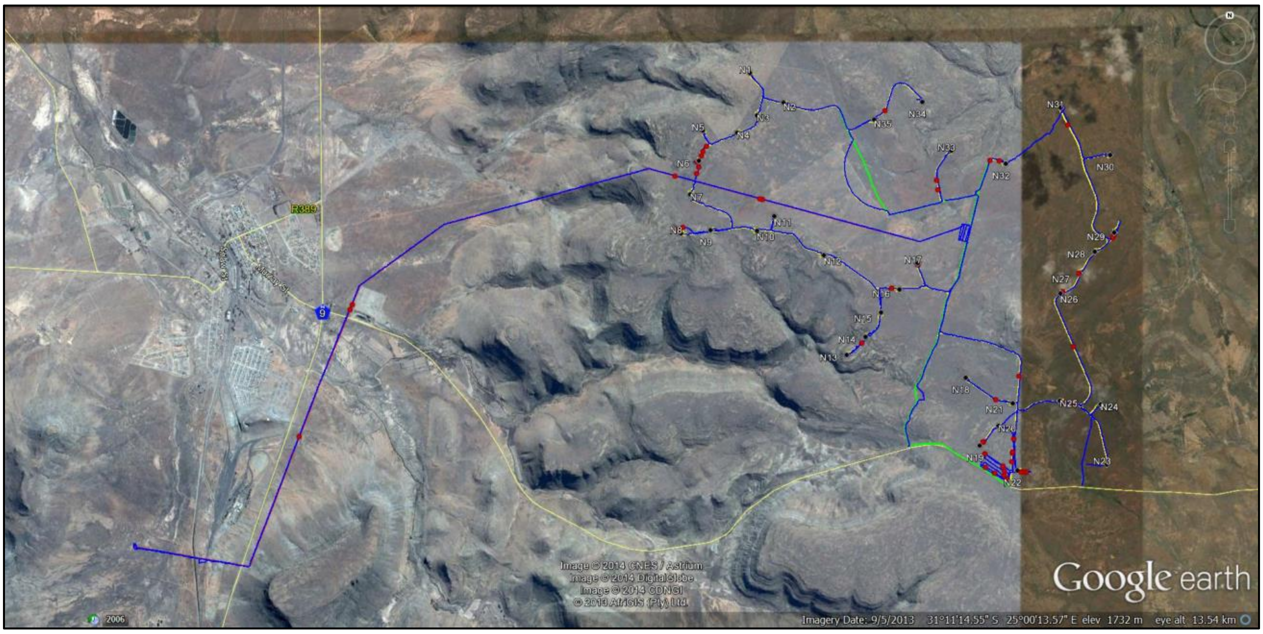


Figure 2. The walk-through track in blue superimposed on the layout of the Noupoort Wind Energy Facility. Locations of species or features of potential concern that were observed during the walk-through are indicated in red.

Sensitive Habitats

The power line traverses a number a sensitive habitats which will be briefly described here along with any recommendations resulting from the observations. Starting from the connection point with the Eskom line, there is a wetland and drainage line between pylons 4 and 5, but both pylons are outside the sensitive area and no specific changes or recommendations are made in this regard. There is a small wetland between pylons 13 and 14, but the feature is very small and not directly beneath the line and it is unlikely that the power line would pose a direct threat to this feature. Similarly, the power line traverses the Noupoort River between pylons 16 and 17, but the apart from the fact the river itself is degraded at this point, the pylons are not near to the river itself and no additional mitigation or avoidance measures are recommended. The power line passes over the edge of small farm earth dam between pylons 22 and 23 and as this feature may attract waterfowl, it is recommended that the power line should be fitted with bird flight diverters from pylon 22 to 24. From pylon 30 to 35 the power line navigates the mountain slope from the plains to the plateau and this whole section should be considered sensitive on account of the slope as well as the presence of ecologically sensitive habitats on the slopes and rocky outcrops in this area. Although no specific recommendations are made with regards to the locations of the pylons, which are all deemed acceptable, disturbance in this area should be kept to a minimum and a permanent service road should not be constructed beneath the power line in this section of the route. From pylon 36 to 50 at the on-site substation, the power line traverses the plateau within the wind farm and while there are recommendations with regards to moving any of the pylons, a number of protected species were observed along the route and their locations are provided at the end of the report as a precaution, so that they can be avoided where necessary.

In terms of the wind farm three significant features were identified which require action. In the first instance, the access road between Turbines 6 and 7 runs directly along a small ridge which would be easily avoided by moving the road about 10m to the west for a short section of about 100m. The section is illustrated below, with an alternative route recommendation. In addition, there is a sensitive feature near to Turbine 6 which is also illustrated below, this area consists of a rock platform containing numerous pools containing tadpoles, temporary water organisms and the wetland plant *Limosella grandiflora*. As such features were not observed elsewhere, they are considered unique and sensitive and should not be impacted by the development. Although the current layout does not impinge on the pools, they are highlighted as a sensitive feature in close proximity to Turbine 6, and specific measures such as the use of construction tape to cordon the area off during construction is recommended to safeguard these features.

Figure 3. Satellite image showing the sensitive ridge habitat along the access road between Turbines 6 and 7, and the recommended alternative route in white. The image also illustrates the location of the rock platform with freshwater pools near to Turbine 6. This area should be avoided as the pools are not a common feature in the area. Note that the orientation of the map is with north to the right.

Figure 4. Photograph illustrating the route of the access road between Turbines 6 and 7, which runs directly along a small rocky ledge which could be easily avoided by moving the access road about 10 m towards the west, which would be the right in the current photo.

Figure 5. One of the small pools on the rock platform near to Turbine 6. There are several pools in the area, some of which are not vegetated, but all of which were observed to contain brine shrimps as well as tadpoles. These pools should not be impacted by the development as they are not common in the area.

The final feature of concern is Turbine 8, which is located off the edge of the plateau on a steep and rocky slope. It is strongly recommended that the turbine is relocated to a more accessible position to the north of the current location. The current location would require an excessive amount of disturbance during construction and would pose a long-term erosion risk to the area. The satellite imagery and photographs of the current site clearly illustrate the large boulders present and the steep nature of the area. There is ample suitable ground less than 100m from the current location, where the turbine would generate significantly less disturbance and the risk of secondary impact sufficiently low.

Figure 6. The location of Turbine 8, illustrating the rocky nature of the current location. The green-highlighted area indicates the closest suitable area where the turbine might be moved to.

Figure 7. Photographs illustrating the location of Turbine 8, left, on the steep rocky slope and right, the route that the access road to the turbine is currently taking. As this area is very steep, uneven and rocky, the footprint of the turbine would be significantly larger than that required for use and the level of disturbance likely to be generated in the area is deemed to be unacceptably high.

Flora

A total of 43 observations of species of conservation concern were made during the walk-through, indicating the relatively low abundance of species of conservation concern at the site. This includes only one species of true conservation concern, which is not listed as Least Concern by the Red List of South African Plants (2013), that being *Pelargonium sidoides*, which is listed as Declining on account of heavy harvesting pressure for use in herbal and traditional medicine. This species was however relatively common at the site and almost half the total observation were of this species. Since this species is low-growing and not conspicuous when not in flower, it is likely that additional plants are present that were not observed during the walk-through, however even if only half the plant were observed, this is still a relatively low total in relation to the local population. Given the relative abundance of this species at the site, the number of individuals within the development footprint is relatively low and does not constitute a significant proportion of the local population of this species. Other common species include *Euphorbia clavarioides* and *Brunsvigia radulosa*, both of which are relatively widespread species which are not currently considered to be under threat. *Euphorbia clavarioides* is relatively common at the site on gravelly soils on hills and outcrops and as such tends to be clumped in distribution. *Brunsvigia radulosa* is relatively scattered at the site and occurs as isolated individuals, usually quite far from other individuals. *Euphorbia clavarioides* is not a good candidate for search and rescue due to the rocky habitat it grows in as well as its deep roots and low probability of survival. Therefore, all individuals of this plant in the footprint are likely to be lost. *Brunsvigia radulosa* has a large bulb that makes it an ideal candidate for search and rescue, but is important to note that it is only visible while the leaves or flowers are present.

A notable observation at the site is that of *Neohenricia sibbettii*, which is a small succulent confined to shallow pans of soil on rock pavement along the edge of the escarpment at the site. According to the SANBI SIBIS database, this species is known from only seven quarter degree squares in the vicinity of the juncture of the Northern Cape, Eastern Cape and Free State and has not been recorded from the current area before. Given the relatively specialised habitat of this species it is unlikely that it can be successfully translocated. Although areas of rock pavement are relatively common at the site, this species was observed only along the edge of the escarpment and probably relies on the greater frequency of wetting along the edge of the escarpment compared to areas away from the edge. As such, the availability of habitat for this species is restricted and it is probably not widespread at the site. Consequently, the presence of this species at the site is considered significant and given the poor translocation potential of this species, avoidance measures should be implemented where possible.

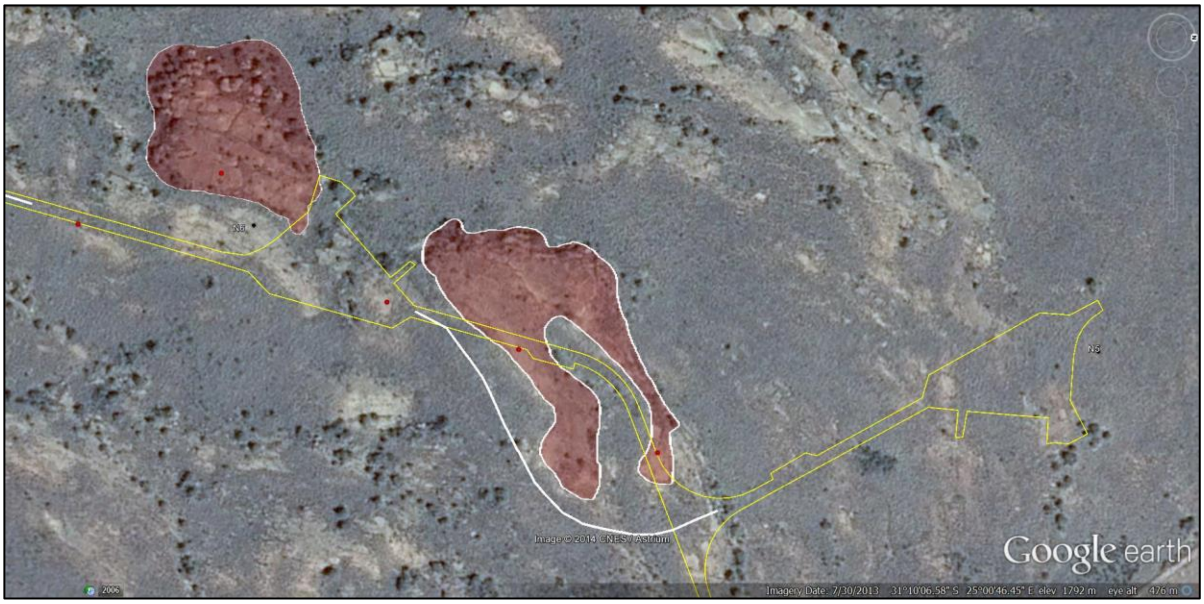


Figure 8. The area where *Neohenricia sibbettii* is prevalent occurs between Turbine 5 and 6 and an alternative access road routing is recommended in white.

It is important to note that the walk-through does not cover all protected species and this would not be possible, given that many of the dominant species at the site are protected despite being very common by virtue of the fact that whole families and genera are protected under the Northern Cape Nature Conservation Act. While this is not a concern for the current purposes, such species would need to be listed for the clearing permit required for the site before construction commences. A list of all the protected species known from the area, extracted from the SANBI SIBIS database is provided for this purpose in Annex 2 of this report and includes a list of which species were actually observed at the site.

Fauna

Active burrows of larger fauna were relatively scarce within the development footprint and only three such observations were made. In each case, these consisted of large burrows that appeared to be currently in use by species such as Aardvark and Cape Porcupine. It is however important to note that several different species frequently make use of the same burrow entrance which may diverge below ground. As suitable locations for burrows are often relatively scarce in the landscape, such burrows may be utilized for many years and are not easily replaced. Two of the burrows are located along the access road to Turbine 33, within an area that, on the satellite imagery of the site, is visibly distinct from the surrounding area suggesting that this area has been specifically targeted by fauna. It is recommended that the access road is shifted north or south to avoid this area as demarcated on the satellite image below.

Figure 9. The area along the access route to Turbine 33 containing several large burrows, and which appears to be a specific area targeted by fauna, which should be avoided, either to the north or south.

Conclusions and Recommendations

The majority of the Noupoort wind farm is located within areas of relatively low biodiversity and which are not considered highly sensitive. There are however a small number of turbines and access roads which are located within areas which are considered relatively high sensitivity on account of habitat or the presence of species of conservation concern. In the majority of cases, relatively simple avoidance or realignment of the infrastructure can be used to avoid the sensitive features present. There do not appear to be any situations in which roads or turbines cannot be realigned or moved a relatively small distance to avoid the sensitive features present. The follow specific recommendations are made with regards to the current location of the infrastructure:

- Turbine 8 should be relocated to the north of the current location. The current site is off the edge of the escarpment on the steep slope of the mountainside and construction in this area would create a disproportionately high level of negative impact that can avoided be moving the turbine location to within the demarcated suitable area or someone else nearby on the plateau.
- The access road between Turbine 6 and 7 should realigned as illustrated about 10m west of the current position to avoid the rocky ledge that would be impacted under the current alignment.
- There are some rock pools in the vicinity of Turbine 6 that should not be impacted as they are identified as a unique feature of the area and provide breeding habitat for fauna that is not available elsewhere in the vicinity.

- The access road between Turbine 5 and 6 should be realigned to avoid impact to a population of the cryptic habitat-specialist succulent *Neohenricia sibbettii*.
- There is a sensitive area from a fauna perspective along the access route to Turbine 33 and the road should be realigned to avoid the demarcated area.

The following resources are provided as accompaniment to this report:

- Coordinates of species of conservation concern observed at the site.
- KML file of the sensitive areas or recommended use areas as illustrated in the report, with alternative alignment options where appropriate.
- Photographic guide illustrating all the different plant species of conservation concern as mentioned in the text of the report.
- Photographs of all of the turbine locations and other infrastructure sites within the development.

Photographic Guide to Species of Concern

Brunsvigia radulosa

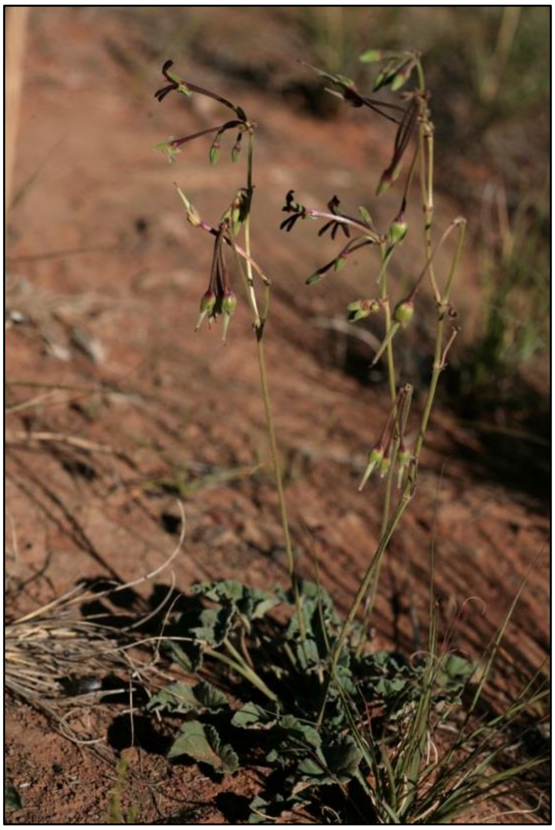
Euphorbia clavarioides var. clavarioides

Kniphofia ensifolia subsp. ensifolia

Neohenricia sibbettii

Pelargonium abrotanifolium

Pelargonium sidoides



Syringodea concolor

Annex 1. List of Coordinates

Coordinates of listed and protected plant species as well as faunal burrows that should be avoided.

Waypoint ID	Latitude	Longitude	Species	Status IUCN	N-Cape
5	-31.20248197	25.05361998	*Brunsvigia radulosa*	LC	Schedule 2
6	-31.19663802	25.05140598	*Brunsvigia radulosa*	LC	Schedule 2
7	-31.18653498	24.96698496	*Brunsvigia radulosa*	LC	Schedule 2
8	-31.19069098	25.061563	*Brunsvigia radulosa*	LC	Schedule 2
9	-31.18597699	24.96728998	*Brunsvigia radulosa*	LC	Schedule 2
10	-31.178485	25.06670999	*Brunsvigia radulosa*	LC	Schedule 2
42	-31.20475204	25.055378	*Brunsvigia radulosa*	LC	Schedule 2
11	-31.20133398	25.04982901	*Euphorbia clavarioides*	LC	Schedule 3
12	-31.18415804	25.03781497	*Euphorbia clavarioides*	LC	Schedule 3
13	-31.18138304	25.04135801	*Euphorbia clavarioides*	LC	Schedule 3
14	-31.17823396	25.06683396	*Euphorbia clavarioides*	LC	Schedule 3
15	-31.18250102	25.06226901	*Euphorbia clavarioides*	LC	Schedule 3
16	-31.20472404	25.05502403	*Euphorbia clavarioides*	LC	Schedule 3
17	-31.20474298	25.05472002	*Euphorbia clavarioides*	LC	Schedule 3
18	-31.16586302	25.060843	*Euphorbia clavarioides*	LC	Schedule 3
19	-31.19717102	25.06171396	*Kniphofia ensifolia*	LC	Schedule 2
20	-31.16983596	25.05064901	*Kniphofia ensifolia*	LC	Schedule 2
3	-31.16881999	25.01313002	*Neohenricia sibbettii*	LC	Schedule 2
4	-31.16825899	25.01359697	*Neohenricia sibbettii*	LC	Schedule 2
24	-31.16934797	25.01292299	*Pelargonium abrotanifolium*	LC	Schedule 2
25	-31.17160102	25.00947702	*Pelargonium abrotanifolium*	LC	Schedule 2
1	-31.17760699	25.009833	*Pelargonium sidoides*	Declining	Schedule 2
2	-31.17733802	25.01051998	*Pelargonium sidoides*	Declining	Schedule 2
21	-31.16989497	25.05186497	*Pelargonium sidoides*	Declining	Schedule 2
22	-31.18453003	25.06015099	*Pelargonium sidoides*	Declining	Schedule 2
23	-31.20551303	25.052877	*Pelargonium sidoides*	Declining	Schedule 2
26	-31.20487701	25.05127899	*Pelargonium sidoides*	Declining	Schedule 2
27	-31.20422096	25.05006303	*Pelargonium sidoides*	Declining	Schedule 2
28	-31.18152101	25.04116799	*Pelargonium sidoides*	Declining	Schedule 2
29	-31.19029904	25.03389903	*Pelargonium sidoides*	Declining	Schedule 2
30	-31.17421199	25.02091697	*Pelargonium sidoides*	Declining	Schedule 2
31	-31.174143	25.02057198	*Pelargonium sidoides*	Declining	Schedule 2
32	-31.20512	25.05250501	*Pelargonium sidoides*	Declining	Schedule 2
33	-31.17058396	25.01259098	*Pelargonium sidoides*	Declining	Schedule 2
34	-31.20269403	25.04999799	*Pelargonium sidoides*	Declining	Schedule 2
35	-31.16427197	25.036927	*Pelargonium sidoides*	Declining	Schedule 2
36	-31.20407302	25.05233503	*Pelargonium sidoides*	Declining	Schedule 2
37	-31.20359098	25.05350598	*Pelargonium sidoides*	Declining	Schedule 2
38	-31.20263301	25.053596	*Pelargonium sidoides*	Declining	Schedule 2
39	-31.20102301	25.05377596	*Pelargonium sidoides*	Declining	Schedule 2
40	-31.20140104	25.04970001	*Pelargonium sidoides*	Declining	Schedule 2
41	-31.19400501	25.054459	*Pelargonium sidoides*	Declining	Schedule 2

43	-31.20463704	25.052546	*Syringodea concolor*	LC	Schedule 2

Annex 2: List of Protected Species

List of protected species known from the broad vicinity of the Noupoort Wind Energy Facility, based on the SANBI SIBIS database. Not all species marked as present were observed within the development footprint, but are highlighted here so that they can be avoided if observed.

Family	Species	IUCN	N Cape	Present
Mesembryanthemaceae	*Chasmatophyllum maninum*	DDD	Schedule 2	
Mesembryanthemaceae	*Drosanthemum subplanum*	DDT	Schedule 2	
Mesembryanthemaceae	*Nananthus vittatus*	DDT	Schedule 2	
Santalaceae	*Thesium glomeratum*	DDT	Schedule 2	
Amaryllidaceae	*Boophone disticha*	Declining	Schedule 2	
Asteraceae	*Cineraria lobata subsp. lobata*	Declining	Schedule 2	
Geraniaceae	***Pelargonium sidoides***	**Declining**	**Schedule 1**	**1**
Gunneraceae	*Gunnera perpensa*	Declining	Schedule 2	
Hyacinthaceae	*Drimia altissima*	Declining	Schedule 2	
Asteraceae	*Gnaphalium declinatum*	NT	Schedule 1	
Asteraceae	*Eriocephalus grandiflorus*	Rare	Schedule 2	
Portulacaceae	*Anacampseros subnuda subsp. lubbersii*	VU	Schedule 2	
Asphodelaceae	***Kniphofia ensifolia subsp. ensifolia***	**LC**	**Schedule 2**	**1**
Amaryllidaceae	***Brunsvigia radulosa***	**LC**	**Schedule 2**	**1**
Amaryllidaceae	*Cyrtanthus contractus*	LC	Schedule 2	
Amaryllidaceae	*Haemanthus humilis subsp. hirsutus*	LC	Schedule 2	
Amaryllidaceae	*Haemanthus humilis subsp. humilis*	LC	Schedule 2	
Amaryllidaceae	*Strumaria gemmata*	LC	Schedule 2	1
Apiaceae	*Berula erecta subsp. thunbergii*	LC	Schedule 2	
Apiaceae	*Bupleurum mundii*	LC	Schedule 2	
Apiaceae	*Conium chaerophylloides*	LC	Schedule 2	
Apiaceae	*Deverra burchellii*	LC	Schedule 2	
Apiaceae	*Deverra denudata subsp. aphylla*	LC	Schedule 2	
Apiaceae	*Heteromorpha arborescens var. arborescens*	LC	Schedule 2	
Apiaceae	*Peucedanum caffrum*	LC	Schedule 2	
Apocynaceae	*Asclepias crispa var. crispa*	LC	Schedule 2	
Apocynaceae	*Ceropegia filiformis*	LC	Schedule 2	
Apocynaceae	*Cordylogyne globosa*	LC	Schedule 2	
Apocynaceae	*Duvalia caespitosa subsp. pubescens*	LC	Schedule 2	
Apocynaceae	*Fockea sinuata*	LC	Schedule 2	
Apocynaceae	*Gomphocarpus tomentosus subsp. tomentosus*	LC	Schedule 2	
Apocynaceae	*Microloma armatum var. armatum*	LC	Schedule 2	
Apocynaceae	*Pachypodium succulentum*	LC	Schedule 2	
Apocynaceae	*Sarcostemma viminale subsp. viminale*	LC	Schedule 2	
Apocynaceae	*Schizoglossum bidens subsp. atrorubens*	LC	Schedule 2	
Apocynaceae	*Schizoglossum eustegioides*	LC	Schedule 2	
Apocynaceae	*Schizoglossum linifolium var. centrirostratum*	LC	Schedule 2	
Apocynaceae	*Stapelia grandiflora var. grandiflora*	LC	Schedule 2	

Apocynaceae	*Stenostelma capense*	LC	Schedule 2	
Apocynaceae	*Tridentea gemmiflora*	LC	Schedule 2	
Apocynaceae	*Xysmalobium gomphocarpoides var. gomphocarpoides*	LC	Schedule 2	
Araliaceae	*Cussonia paniculata subsp. paniculata*	LC	Schedule 2	
Asphodelaceae	*Aloe aristata*	LC	Schedule 2	
Asphodelaceae	*Aloe broomii var. broomii*	LC	Schedule 2	1
Asphodelaceae	*Aloe claviflora*	LC	Schedule 2	
Asphodelaceae	*Aloe microstigma subsp. microstigma*	LC	Schedule 2	
Asphodelaceae	*Bulbine abyssinica*	LC	Schedule 2	
Asphodelaceae	*Bulbine asphodeloides*	LC	Schedule 2	
Asphodelaceae	*Bulbine frutescens*	LC	Schedule 2	
Asphodelaceae	*Bulbine narcissifolia*	LC	Schedule 2	
Asphodelaceae	*Haworthia venosa subsp. tessellata*	LC	Schedule 2	
Asphodelaceae	*Kniphofia linearifolia*	LC	Schedule 2	
Asphodelaceae	*Kniphofia stricta*	LC	Schedule 2	
Asphodelaceae	*Trachyandra asperata var. asperata*	LC	Schedule 2	
Asphodelaceae	*Trachyandra asperata var. macowanii*	LC	Schedule 2	
Asphodelaceae	*Trachyandra saltii var. oatesii*	LC	Schedule 2	
Asphodelaceae	*Trachyandra saltii var. saltii*	LC	Schedule 2	
Caryophyllaceae	*Dianthus caespitosus subsp. caespitosus*	LC	Schedule 2	1
Caryophyllaceae	*Dianthus micropetalus*	LC	Schedule 2	
Colchicaceae	*Ornithoglossum dinteri*	LC	Schedule 2	
Colchicaceae	*Ornithoglossum viride*	LC	Schedule 2	
Colchicaceae	*Ornithoglossum vulgare*	LC	Schedule 2	
Crassulaceae	*Adromischus cooperi*	LC	Schedule 2	
Crassulaceae	*Adromischus maculatus*	LC	Schedule 2	
Crassulaceae	*Adromischus nanus*	LC	Schedule 2	
Crassulaceae	*Adromischus sphenophyllus*	LC	Schedule 2	
Crassulaceae	*Adromischus trigynus*	LC	Schedule 2	
Crassulaceae	*Cotyledon orbiculata var. dactylopsis*	LC	Schedule 2	1
Crassulaceae	*Cotyledon orbiculata var. oblonga*	LC	Schedule 2	
Crassulaceae	*Crassula capitella subsp. capitella*	LC	Schedule 2	
Crassulaceae	*Crassula capitella subsp. thyrsiflora*	LC	Schedule 2	
Crassulaceae	***Crassula corallina subsp. corallina***	**LC**	**Schedule 2**	**1**
Crassulaceae	*Crassula dependens*	LC	Schedule 2	
Crassulaceae	*Crassula lanceolata subsp. lanceolata*	LC	Schedule 2	
Crassulaceae	*Crassula lanuginosa var. lanuginosa*	LC	Schedule 2	
Crassulaceae	*Crassula muscosa var. muscosa*	LC	Schedule 2	
Crassulaceae	*Crassula natans var. minus*	LC	Schedule 2	
Crassulaceae	*Crassula nudicaulis var. nudicaulis*	LC	Schedule 2	
Crassulaceae	*Crassula pyramidalis*	LC	Schedule 2	
Crassulaceae	*Crassula sarcocaulis subsp. rupicola*	LC	Schedule 2	
Crassulaceae	*Crassula sarcocaulis subsp. sarcocaulis*	LC	Schedule 2	
Crassulaceae	*Crassula subaphylla var. subaphylla*	LC	Schedule 2	
Crassulaceae	*Crassula tetragona subsp. acutifolia*	LC	Schedule 2	
Crassulaceae	*Crassula umbellata*	LC	Schedule 2	
Euphorbiaceae	*Euphorbia aequoris*	LC	Schedule 2	
Euphorbiaceae	*Euphorbia aggregata var. aggregata*	LC	Schedule 2	

Euphorbiaceae	*Euphorbia brachiata*	LC	Schedule 2	
Euphorbiaceae	*Euphorbia caterviflora*	LC	Schedule 2	
Euphorbiaceae	***Euphorbia clavarioides var. clavarioides***	**LC**	**Schedule 2**	**1**
Euphorbiaceae	*Euphorbia epicyparissias*	LC	Schedule 2	
Euphorbiaceae	*Euphorbia inaequilatera var. inaequilatera*	LC	Schedule 2	
Euphorbiaceae	*Euphorbia mauritanica var. mauritanica*	LC	Schedule 2	
Euphorbiaceae	*Euphorbia rectirama*	LC	Schedule 2	
Geraniaceae	***Pelargonium abrotanifolium***	**LC**	**Schedule 1**	**1**
Geraniaceae	*Pelargonium alchemilloides*	LC	Schedule 1	
Geraniaceae	*Pelargonium aridum*	LC	Schedule 1	
Geraniaceae	*Pelargonium crithmifolium*	LC	Schedule 1	
Geraniaceae	*Pelargonium dichondrifolium*	LC	Schedule 1	
Geraniaceae	*Pelargonium griseum*	LC	Schedule 1	
Geraniaceae	*Pelargonium grossularioides*	LC	Schedule 1	
Geraniaceae	*Pelargonium laxum subsp. laxum*	LC	Schedule 1	
Geraniaceae	*Pelargonium minimum*	LC	Schedule 1	1
Geraniaceae	*Pelargonium multicaule subsp. multicaule*	LC	Schedule 1	
Geraniaceae	*Pelargonium ramosissimum*	LC	Schedule 1	
Geraniaceae	*Pelargonium tragacanthoides*	LC	Schedule 1	
Hyacinthaceae	*Daubenya comata*	LC	Schedule 2	
Hyacinthaceae	*Eucomis regia*	LC	Schedule 2	
Hyacinthaceae	*Ornithogalum juncifolium var. juncifolium*	LC	Schedule 2	
Hyacinthaceae	*Ornithogalum longibracteatum*	LC	Schedule 2	
Hyacinthaceae	*Ornithogalum prasinum*	LC	Schedule 2	
Hyacinthaceae	*Ornithogalum tenuifolium subsp. tenuifolium*	LC	Schedule 2	
Iridaceae	*Freesia andersoniae*	LC	Schedule 2	
Iridaceae	*Gladiolus permeabilis subsp. edulis*	LC	Schedule 2	
Iridaceae	*Moraea bipartita*	LC	Schedule 2	
Iridaceae	*Moraea crispa*	LC	Schedule 2	
Iridaceae	*Moraea falcifolia*	LC	Schedule 2	
Iridaceae	*Moraea pallida*	LC	Schedule 2	
Iridaceae	***Moraea polystachya***	**LC**	**Schedule 2**	**1**
Iridaceae	*Moraea simulans*	LC	Schedule 2	
Iridaceae	*Romulea macowanii var. macowanii*	LC	Schedule 2	
Iridaceae	*Syringodea bifucata*	LC	Schedule 2	
Iridaceae	***Syringodea concolor***	**LC**	**Schedule 2**	**1**
Mesembryanthemaceae	*Chasmatophyllum musculinum*	LC	Schedule 2	
Mesembryanthemaceae	*Chasmatophyllum verdoorniae*	LC	Schedule 2	
Mesembryanthemaceae	*Delosperma aberdeenense*	LC	Schedule 2	
Mesembryanthemaceae	*Delosperma lootsbergense*	LC	Schedule 2	
Mesembryanthemaceae	*Delosperma multiflorum*	LC	Schedule 2	
Mesembryanthemaceae	*Drosanthemum lique*	LC	Schedule 2	
Mesembryanthemaceae	*Lampranthus uniflorus*	LC	Schedule 2	
Mesembryanthemaceae	*Malephora mollis*	LC	Schedule 2	
Mesembryanthemaceae	*Mesembryanthemum aitonis*	LC	Schedule 2	
Mesembryanthemaceae	*Mesembryanthemum crystallinum*	LC	Schedule 2	
Mesembryanthemaceae	*Mesembryanthemum guerichianum*	LC	Schedule 2	
Mesembryanthemaceae	*Mestoklema tuberosum*	LC	Schedule 2	

Mesembryanthemaceae	*Psilocaulon articulatum*	LC	Schedule 2	
Mesembryanthemaceae	*Psilocaulon coriarium*	LC	Schedule 2	
Mesembryanthemaceae	*Rabiea albinota*	LC	Schedule 2	
Mesembryanthemaceae	*Rabiea difformis*	LC	Schedule 2	
Mesembryanthemaceae	*Ruschia grisea*	LC	Schedule 2	
Mesembryanthemaceae	*Ruschia hamata*	LC	Schedule 2	
Mesembryanthemaceae	*Ruschia indurata*	LC	Schedule 2	
Mesembryanthemaceae	*Ruschia putterillii*	LC	Schedule 2	1
Mesembryanthemaceae	*Ruschia semidentata*	LC	Schedule 2	
Mesembryanthemaceae	*Ruschia uitenhagensis*	LC	Schedule 2	1
Mesembryanthemaceae	*Stomatium paucidens*	LC	Schedule 2	1
Mesembryanthemaceae	*Stomatium peersii*	LC	Schedule 2	1
Mesembryanthemaceae	*Trichodiadema attonsum*	LC	Schedule 2	
Mesembryanthemaceae	*Trichodiadema barbatum*	LC	Schedule 2	
Mesembryanthemaceae	*Trichodiadema pomeridianum*	LC	Schedule 2	
Mesembryanthemaceae	*Trichodiadema setuliferum*	LC	Schedule 2	1
Oleaceae	*Olea europaea subsp. africana*	LC	Schedule 2	1
Orchidaceae	*Holothrix schlechteriana*	LC	Schedule 2	
Oxalidaceae	*Oxalis bifurca var. angustiloba*	LC	Schedule 2	
Oxalidaceae	*Oxalis depressa*	LC	Schedule 2	
Oxalidaceae	*Oxalis obliquifolia*	LC	Schedule 2	
Oxalidaceae	*Oxalis pes-caprae var. pes-caprae*	LC	Schedule 2	
Oxalidaceae	*Oxalis semiloba subsp. semiloba*	LC	Schedule 2	1
Oxalidaceae	*Oxalis smithiana*	LC	Schedule 2	
Portulacaceae	*Anacampseros filamentosa subsp. filamentosa*	LC	Schedule 2	1
Portulacaceae	*Anacampseros telephiastrum*	LC	Schedule 2	
Portulacaceae	*Avonia ustulata*	LC	Schedule 2	1
Scrophulariaceae	*Diascia capsularis*	LC	Schedule 2	
Scrophulariaceae	*Jamesbrittenia atropurpurea subsp. atropurpurea*	LC	Schedule 2	
Scrophulariaceae	*Jamesbrittenia aurantiaca*	LC	Schedule 2	
Scrophulariaceae	*Jamesbrittenia filicaulis*	LC	Schedule 2	
Scrophulariaceae	*Manulea plurirosulata*	LC	Schedule 2	
Scrophulariaceae	*Nemesia fruticans*	LC	Schedule 2	
Scrophulariaceae	*Nemesia pubescens var. pubescens*	LC	Schedule 2	
Scrophulariaceae	*Nemesia versicolor var. versicolor*	LC	Schedule 2	

Photographs of Turbine Positions and other Infrastructure

Laydown & Storage Area

The on-site storage area is a flat open area of grassland with some scattered shrubs and rocky areas. *Pelargonium sidoides* was relatively common within the area with 6 sightings of this species and probably a similar number present that were overlooked. A small population of *Syringodea concolor* was observed in a rocky area in the north-eastern section of the site.

On-site Substation and Control Buildings

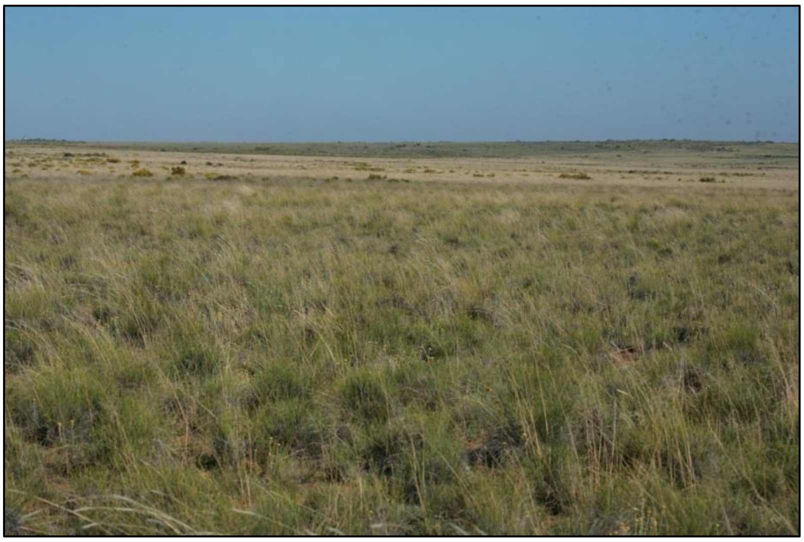
The site of the on-site substation and control buildings is gently sloping grassland with *Euryops* and *Elytropappus* present, no species of conservation were observed in the footprint and it is not considered sensitive.

Power Line

The location of the connection point to the Eskom grid on the flats south of Noupoort. There were no species of conservation concern recorded in this area.

Looking from the turning point east of the N9 towards the connection point with the Eskom grid. The line passes to the right of the second tree from left, over the wetland and drainage line present in the same area.

The steep ascent up the face of the mountain side towards the top of the plateau. This area is considered generally sensitive and disturbance in this area should be kept to a minimum.



The section of power line from the on-site substation to the edge of the escarpment consists mostly of open grassland and few observations of species of conservation concern were made over this section.

Turbines

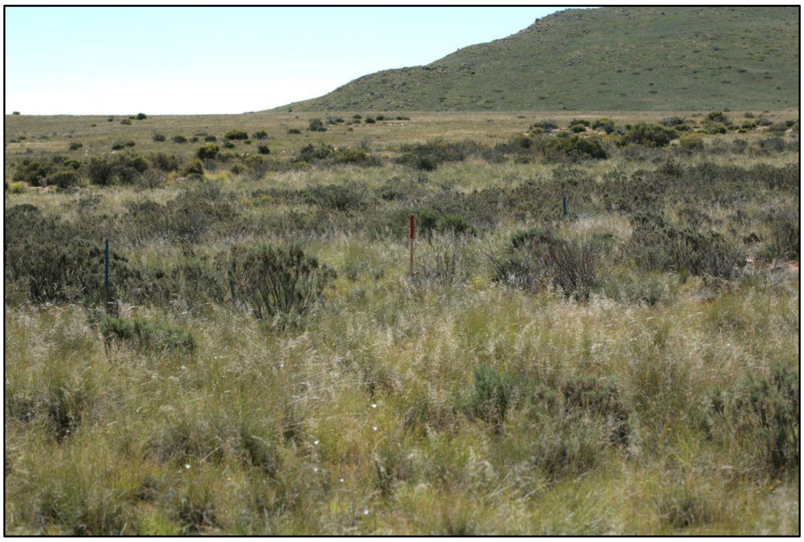
Turbine 1

No habitats or species of concern observed.

Turbine 2

No habitats or species of concern observed.

Turbine 3

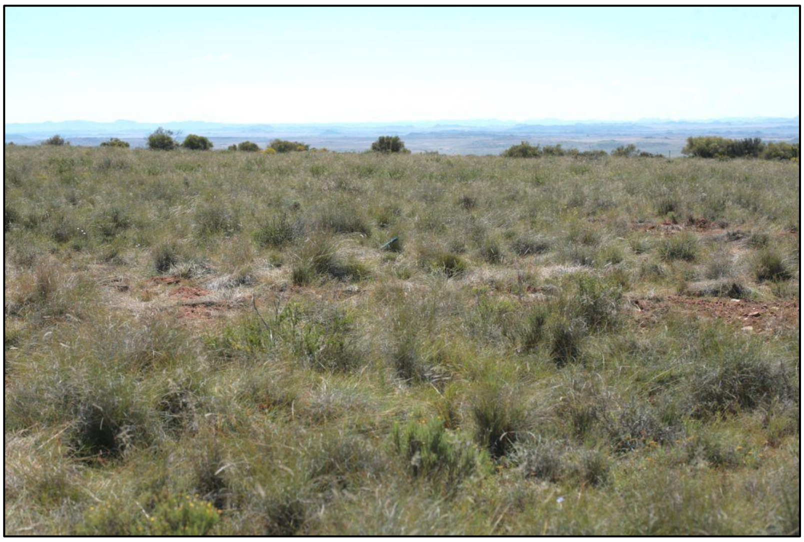


No habitats or species of concern observed.

Turbine 4

No habitats or species of concern observed.

Turbine 5



No habitats or species of concern observed.

Turbine 6

Avoid impact to the rock pools as delineated in Figure 3.

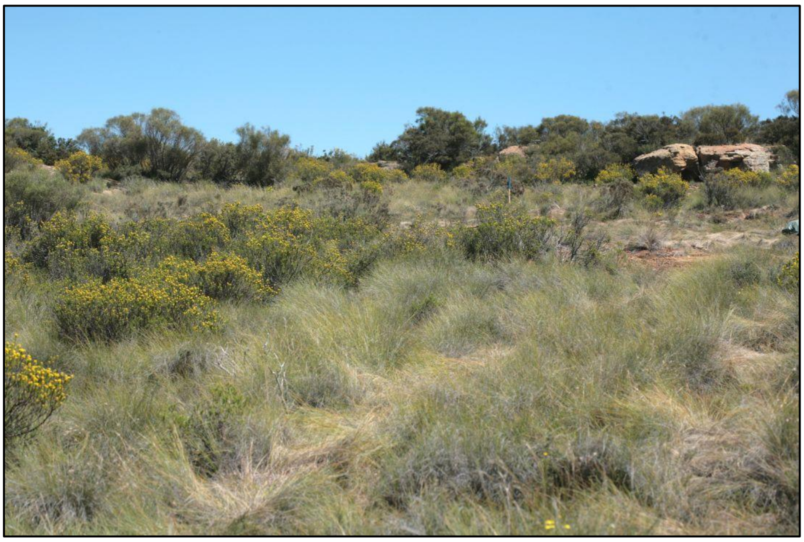
Turbine 7

No habitats or species of concern observed.

Turbine 8

Turbine 8 should be relocated to avoid the above rocky slopes, the area to the north and delineated in Figure 8, was identified as suitable during the walk through.

Turbine 9

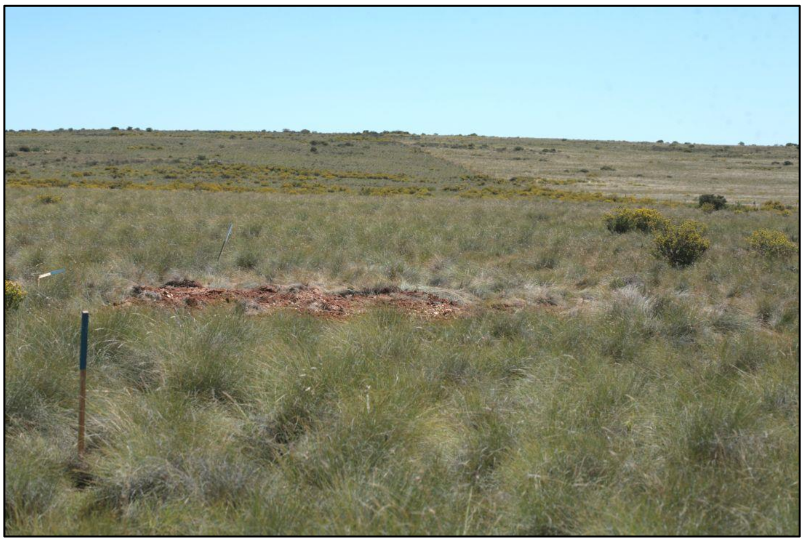


No habitats or species of concern observed.

Turbine 10

No habitats or species of concern observed.

Turbine 11



No habitats or species of concern observed.

Turbine 12

No habitats or species of concern observed.

Turbine 13

Turbine located on a small rocky promontory and disturbance to the area should be kept to a minimum.

Turbine 14

Turbine located in a rocky area with some slopes and disturbance should be kept as low as possible in this area.

Turbine 15

No habitats or species of concern observed.

Turbine 16

No habitats or species of concern observed.

Turbine 17

Euphorbia clavarioides and *Pelargoium sidioides* present in the footprint.

Turbine 18

No habitats or species of concern observed.

Turbine 19

Euphorbia clavarioides and *Pelargoium sidioides* present in the footprint.

Turbine 20

No habitats or species of concern observed.

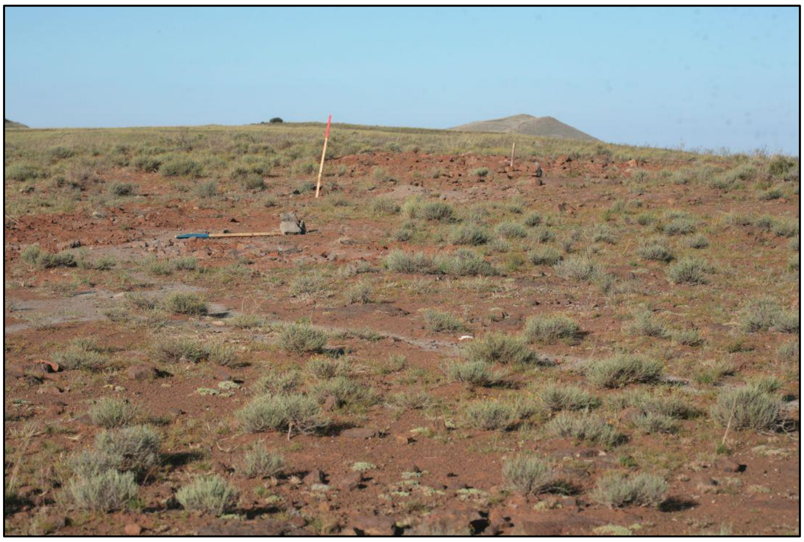
Turbine 21

No habitats or species of concern observed.

Turbine 22

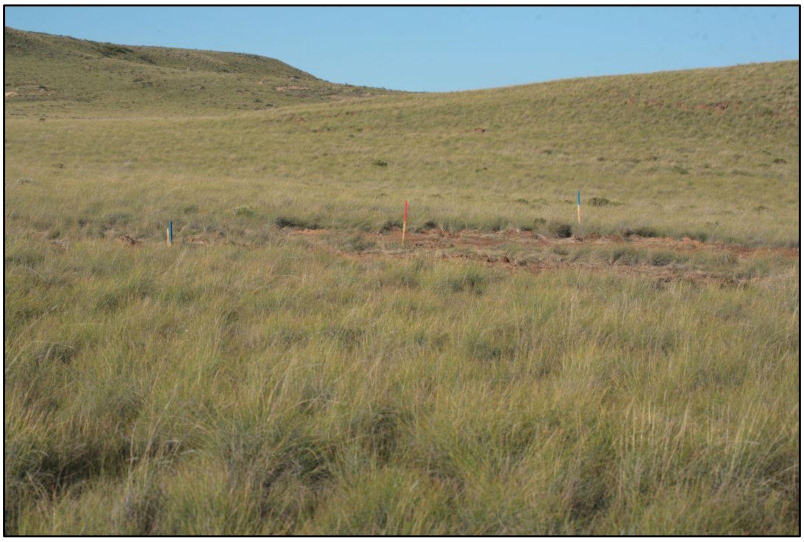
Euphorbia clavarioides and *Brunsvigia radulosa* present in the footprint.

Turbine 23



No habitats or species of concern observed.

Turbine 24



No habitats or species of concern observed.

Turbine 25

Active Burrow observed among the large rocky boulders within the turbine service area – avoid if possible.

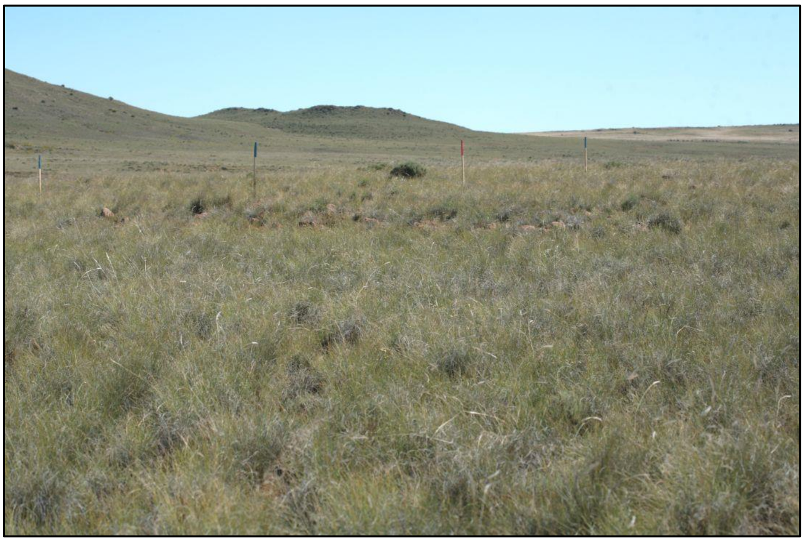
Turbine 26

Pelargoium sidioides present in the footprint.

Turbine 27

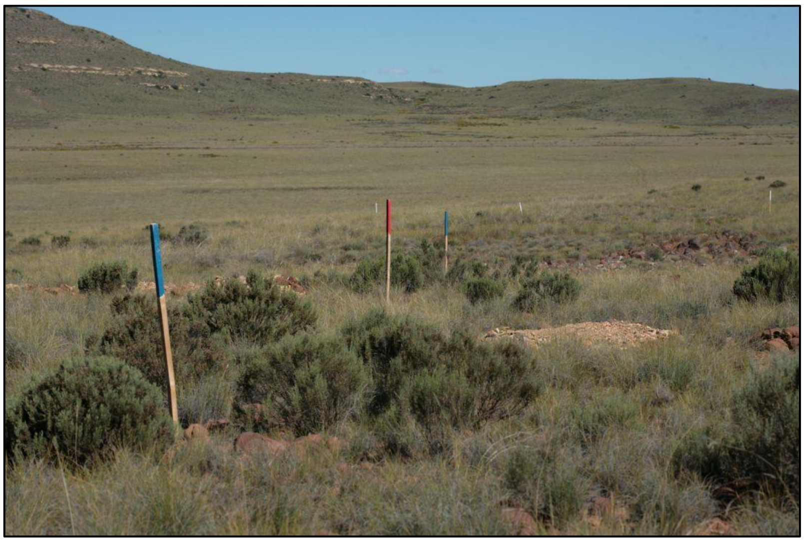
Euphorbia clavarioides present in the footprint. The Turbine is also located on the edge of a small hill and it should be moved a few meters away from the edge if possible.

Turbine 28



No habitats or species of concern observed.

Turbine 29



No habitats or species of concern observed.

Turbine 30

No habitats or species of concern observed.

Turbine 31

No habitats or species of concern observed.

Turbine 32

Pelargoium sidioides present in the footprint.

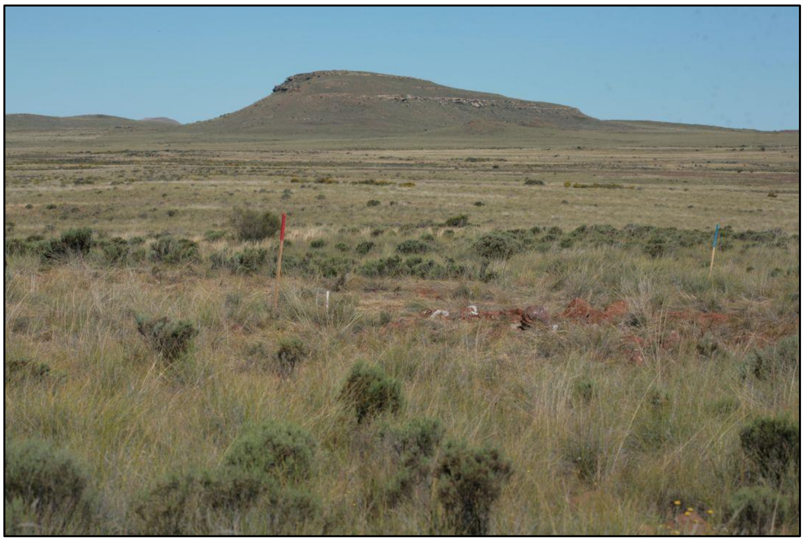
Turbine 33

No habitats or species of concern observed.

Turbine 34

No habitats or species of concern observed.

Turbine 35



No habitats or species of concern observed.

Appendix C

Heritage Walk-down Assessment

SiVest Environmental Division

NOUPOORT WIND ENERGY FACILITY

Heritage Management Plan for Construction

South Africa Mainstream Renewable Power Noupoort (Pty) Ltd

Issue Date: 04 April 2014

Revision No.: 1

Declaration of Independence

The report has been compiled by PGS Heritage, an appointed Heritage Specialist for SiVest Environmental Division. The views stipulated in this report are purely objective and no other interests are displayed during the decision making processes discussed in the Heritage management Plan.

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Date:	*04/04/2014*		
Document Title:	Noupoort Wind Energy Facility – Heritage Management Plan for Construction		
Control	**Name**	**Signature**	**Designation**
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Reviewed PGS	W Fourie		Heritage Specialist/ Principal Investigator
Reviewed SiVest	S Taylor		SiVest Environmental Division

EXECUTIVE SUMMARY

PGS Heritage (PGS) was appointed by SiVest Environmental Division to develop a Heritage Management Plan (HMP) for the construction of the Noupoort Wind Farm and the associated power line, east of the town of Noupoort in the Northern Cape Province.

The outcome of the Heritage Impact Assessment (HIA) completed for the Environmental Impact Assessment of the Noupoort WEF outlined the need for a final walk down and field survey of the infrastructure foot print before construction commences. The recommendations of this walk down will then inform the Environmental Management Program (EMPr) for the management of the construction and operation of the facility.

The outcome of the field work has provided site specific management guidelines for the heritage sites identified as listed below. The rows highlighted are site that are in close proximity to the infrastructure:

HERITAGE SITE NUMBER	MITIGATION / MANAGEMENT MEASURE
Site 1 - Farmstead	Site size: 150m x 200m. Demarcate site and include a 10m buffer area. Monitor during construction phases.
Site 2 - Cemetery	Site size: 30m x 30m. Demarcate site and include a 10m buffer area. Monitor during construction phases.
Site 3 - Rock shelter Archaeological site	Site size: 120m x 40m along the river. Demarcate site and include a 50m buffer area. Monitor during construction phases. No person to visit the rock shelters without a guide.
Site 4 - Farmstead	Site size: 100m x 100m. Demarcate site and include a 10m buffer area. Monitor during construction phases.
Site 5 - Stone walled structures	Site size: 50m x 70m. Demarcate site and include a 10m buffer area. Monitor during construction phases.
Site 6 - Stone walled structures	Site size: 50m x 50m. Demarcate site and include a 10m buffer area. Monitor during construction phases.
Site 7 - Stone walled structures	Site size: 80m x 80m. Demarcate site and include a 10m buffer area. Monitor during construction phases.

Site 8 - Stone walled structures	Site size: 30m x 30m. Demarcate site and include a 10m buffer area. Monitor during construction phases.
Site 9 - Stone walled structures	Site size: 300m x 300m. Demarcate site and include a 10m buffer area. Monitor during construction phases.
Site 10 - Stone walled structure	Site size: 10m x 10m. Demarcate site and include a 10m buffer area. Monitor during construction phases.
Site 11 - Stone walled structure	Site size: 10m x 10m. Demarcate the site with a buffer of 20 meters. If this is not possible and the site will be directly impact by the construction activity, the site must be documented and an application for a destruction permit be lodged with Ngwao-Boswa Jwa Kapa Bokone for the destruction of the site.
Site 12 - Stone walled structure	Site size: 25m x 25m. Demarcate the site with a buffer of 20 meters. If this is not possible and the site will be directly impact by the construction activity, the site must be documented and an application for a destruction permit be lodged with Ngwao-Boswa Jwa Kapa Bokone for the destruction of the site.

Further to the above general guidelines and monitoring is recommended in table 2 and Section 3 of this report.

This document fulfils that requirement as endorsed by South African Heritage Resources Agency (SAHRA).

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Appendices

1 INTRODUCTION

PGS Heritage (PGS) was appointed by SiVest Environmental Division to develop a Heritage Management Plan (HMP) for the construction of the Noupoort Wind Farm on Portions 1 of the Farm 181, Portion 21 of the Farm 182 and on the remainder of the Farm 168, east of the town of Noupoort in the Northern Cape Province.

1.1 Scope of the Study

The scope of this study is to provide site specific heritage management guidelines for the construction activities during the construction of the Noupoort WEF and the associated power line.

1.2 Specialist Qualifications

This Heritage Management Plan (HMP) was compiled by PGS Heritage (PGS).

The staff at PGS has a combined experience of nearly 60 years in the heritage consulting industry. PGS and its staff have extensive experience in managing HIA processes and will only undertake heritage assessment work where they have the relevant expertise and experience to undertake that work competently.

Marko Hutten, heritage specialist and project archaeologist, has 15 years of experience in the industry and is registered with the Association of Southern African Professional Archaeologists (ASAPA) as a Professional Archaeologist and is accredited as a Field Director.

Wouter Fourie, Principal Heritage Specialist for this project, is registered as a Professional Archaeologist with the Association of Southern African Professional Archaeologists (ASAPA) and has CRM accreditation within the said organisation, as well as being accredited as a Professional Heritage Practitioner with the Association of Professional Heritage Practitioners – Western Cape (APHP).

1.3 Legislative Context

The identification, evaluation and assessment of any cultural heritage site, artefact or find in the South African context is required and governed by the following legislation:

i. National Environmental Management Act (NEMA), Act 107 of 1998
ii. National Heritage Resources Act (NHRA), Act 25 of 1999
iii. Mineral and Petroleum Resources Development Act (MPRDA), Act 28 of 2002
iv. Development Facilitation Act (DFA), Act 67 of 1995

The following sections in each Act refer directly to the identification, evaluation and assessment of cultural heritage resources.

i. National Environmental Management Act (NEMA) Act 107 of 1998
    a. Basic Environmental Assessment (BEA) – Section (23)(2)(d)
    b. Environmental Scoping Report (ESR) – Section (29)(1)(d)
    c. Environmental Impact Assessment (EIA) – Section (32)(2)(d)
    d. Environmental Management Programme (EMPr) – Section (34)(b)
ii. National Heritage Resources Act (NHRA) Act 25 of 1999
    a. Protection of Heritage Resources – Sections 34 to 36; and
    b. Heritage Resources Management – Section 38
iii. Mineral and Petroleum Resources Development Act (MPRDA) Act 28 of 2002
    a. Section 39(3)
iv. Development Facilitation Act (DFA) Act 67 of 1995
    a. The GNR.1 of 7 January 2000: Regulations and rules in terms of the Development Facilitation Act, 1995. Section 31.

The NHRA stipulates that cultural heritage resources may not be disturbed without authorization from the relevant heritage authority. Section 34(1) of the NHRA states that, "no person may alter or demolish any structure or part of a structure which is older than 60 years without a permit issued by the relevant provincial heritage resources authority…" The NHRA is utilized as the basis for the identification, evaluation and management of heritage resources and in the case of CRM those resources specifically impacted on by development as stipulated in Section 38 of NHRA, and those developments administered through NEMA, MPRDA and the DFA legislation. In the latter cases the feedback from the relevant heritage resources authority is required by the State and Provincial Departments managing these Acts before any authorizations are granted for development. The last few years have seen a significant change towards the inclusion of heritage assessments as a major component of Environmental Impacts Processes required by NEMA and MPRDA. This change requires us to evaluate the Section of these Acts relevant to heritage (Fourie, 2008).

The NEMA 23(2)(b) states that an integrated environmental management plan should, "…identify, predict and evaluate the actual and potential impact on the environment, socio-economic conditions and cultural heritage".

A study of subsections (23)(2)(d), (29)(1)(d), (32)(2)(d) and (34)(b) and their requirements reveals the compulsory inclusion of the identification of cultural resources, the evaluation of the impacts of the proposed activity on these resources, the identification of alternatives and the management procedures for such cultural resources for each of the documents noted in the Environmental Regulations. A further important aspect to be taken account of in the Regulations under NEMA is the Specialist Report requirements laid down in Section 33 of the regulations (Fourie, 2008).

1.4 Terminology and Abbreviations

Archaeological resources

This includes:

i. material remains resulting from human activity which are in a state of disuse and are in or on land and which are older than 100 years including artefacts, human and hominid remains and artificial features and structures;

ii. rock art, being any form of painting, engraving or other graphic representation on a fixed rock surface or loose rock or stone, which was executed by human agency and which is older than 100 years, including any area within 10m of such representation;

wrecks, being any vessel or aircraft, or any part thereof, which was wrecked in South Africa, whether on land, in the internal waters, the territorial waters or in the maritime culture zone of the republic as defined in the Maritimes Zones Act, and any cargo, debris or artefacts found or associated therewith, which is older than 60 years or which SAHRA considers to be worthy of conservation;

iii. features, structures and artefacts associated with military history which are older than 75 years and the site on which they are found.

Cultural significance

This means aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance

Development

This means any physical intervention, excavation, or action, other than those caused by natural forces, which may in the opinion of the heritage authority in any way result in a change to the nature, appearance or physical nature of a place or influence its stability and future well-being, including:

- construction, alteration, demolition, removal or change in use of a place or a structure at a place;
- carrying out any works on or over or under a place;
- subdivision or consolidation of land comprising a place, including the structures or airspace of a place;
- constructing or putting up for display signs or boards;
- any change to the natural or existing condition or topography of land; and
- any removal or destruction of trees, or removal of vegetation or topsoil

Early Stone Age

The archaeology of the Stone Age between 700 000 and 2 500 000 years ago.

Fossil

Mineralised bones of animals, shellfish, plants and marine animals. A trace fossil is the track or footprint of a fossil animal that is preserved in stone or consolidated sediment.

Heritage

That which is inherited and forms part of the National Estate (historical places, objects, fossils as defined by the National Heritage Resources Act 25 of 1999).

Heritage resources

This means any place or object of cultural significance

Holocene

The most recent geological time period which commenced 10 000 years ago.

Late Stone Age

The archaeology of the last 20 000 years associated with fully modern people.

Late Iron Age (Early Farming Communities)

The archaeology of the last 1000 years up to the 1800's, associated with iron-working and farming activities such as herding and agriculture.

Middle Stone Age

The archaeology of the Stone Age between 20-300 000 years ago, associated with early modern humans.

Palaeontology

Any fossilised remains or fossil trace of animals or plants which lived in the geological past, other than fossil fuels or fossiliferous rock intended for industrial use, and any site which contains such fossilised remains or trace.

ABBREVIATIONS	DESCRIPTION
AIA	Archaeological Impact Assessment
ASAPA	Association of South African Professional Archaeologists
CRM	Cultural Resource Management
DEA	Department of Environmental Affairs
DWA	Department of Water Affairs
EIA practitioner	Environmental Impact Assessment Practitioner
EIA	Environmental Impact Assessment
ESA	Early Stone Age
GPS	Global Positioning System
HIA	Heritage Impact Assessment
HWD	Heritage Walk Down
I&AP	Interested & Affected Party
LSA	Late Stone Age
LIA	Late Iron Age
MSA	Middle Stone Age
MIA	Middle Iron Age

NEMA	National Environmental Management Act
NHRA	National Heritage Resources Act
PHRA	Provincial Heritage Resources Authority
PSSA	Palaeontological Society of South Africa
SADC	Southern African Development Community
SAHRA	South African Heritage Resources Agency
WEF	Wind Energy Facility

1.5 Project description

The proposed construction of the Noupoort Wind Farm will be situated on Portions 1 of the Farm 181, Portion 21 of the Farm 182 and on the remainder of the Farm 168, east of the town of Noupoort in the Noupoort Magisterial District, Northern Cape Province.

The Noupoort Wind Farm will have a capacity of 80MW and will consist of 35 wind turbines. The wind turbines will have a hub height of up to 120m. The rotor diameter will be up to 120m. The wind turbines will not be fixed and will be able to rotate to catch prevailing winds. The foundation of each wind turbine will be approximately 20m x 20m. The footprint for each wind turbine will therefore be approximately 400m². A hard standing area, of approximately 2 400m², for crane usage will accompany each wind turbine. Hence, the total footprint for each wind turbine and the associated hard standing area will be approximately 2 800m². The foundation will be up to approximately 2.5m deep. The wind turbines will be connected by underground cabling (approximately 1m deep) except where the cable cannot be buried. In this instance an overhead power line will be used.

To connect the wind farm to the national electricity grid, a 132kV overhead power line will be constructed that will route from the substation on site towards the south west where it will tie into an existing 132kV overhead power line that routes into Noupoort. The power line will be approximately 13km in length. A substation will be constructed on the wind farm site which will occupy an area of 100m x 100m (approximately 10 000m²). An access road will be constructed that will be 6-10m wide. The roads will be gravel roads and will include turning circles for large trucks and passing points A temporary lay-down area is to be established which will be approximately 5 000m² (including an access route and contractor's site). Other infrastructure will include an administration and warehouse building that will occupy an area of up to 5 000m².

1.6 Methodology

This Heritage Walk Down (HWD) report was compiled by PGS Heritage for the Noupoort WEF, including applicable maps, tables and figures, as stipulated in the NHRA (no 25 of 1999), the National Environmental Management Act (NEMA) (no 107 of 1998) and the Minerals and Petroleum Resources Development Act (MPRDA) (28 of 2002) and requested by the South African Heritage Resources Agency (SAHRA). The HWD process consisted of three steps:

Step I – Literature Review: The background information to the field survey leans greatly on the HIA completed by Dr J. van Schalkwyk in 2011.

Step II – Physical Survey: A physical survey was conducted on foot through the proposed project area by qualified archaeologists (24-28 March 2014), aimed at locating and documenting sites falling within and adjacent to the proposed development footprint.

Step III – The final step involved the recording, documentation and grading (Utilising the heritage grading system in **Appendix B**) of relevant archaeological resources, as well as mapping and constructive recommendations.

1.7 Physical surveying

Due to the nature of cultural remains, with the majority of artefacts occurring below surface, an intensive foot-survey that covered the study area was conducted. A controlled-exclusive surface survey was conducted over a period of 5 days on foot by one archaeologists and field assistant of PGS Heritage. Refer to **Appendix A** for tracklogs of field work.

The survey focussed on the foot print areas of the proposed infrastructure as supplied by SiVest Environmental Division.

All sites discovered both inside and bordering the proposed alignment was plotted on 1:50 000 maps and their GPS co-ordinates documented.

2 SITE SPECIFIC MANAGEMENT MEASURES

The site specific management measures are based on the map provided for the infrastructure of the WEF (***Figure 1***).

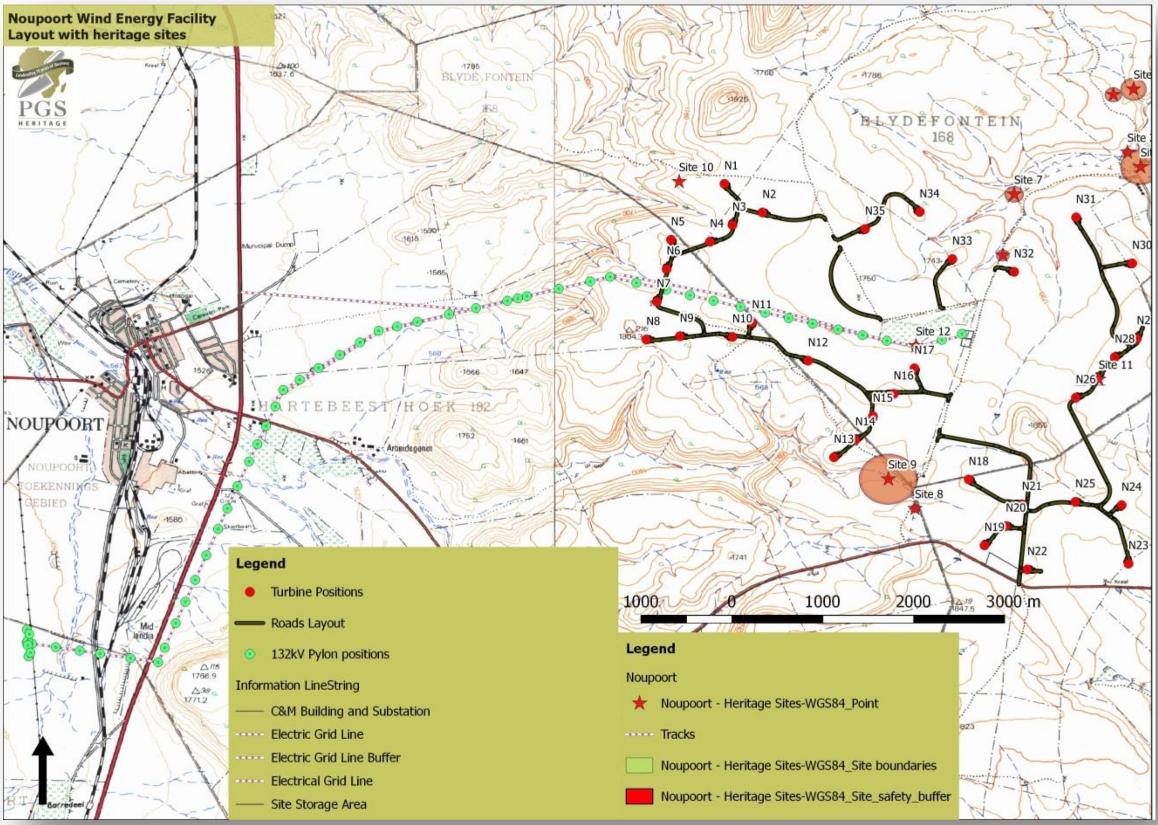


Figure 1 – The Noupoort WEF layout

2.1 Sites identified during the initial HIA

The HIA for the Noupoort WEF was completed by Van Schalkwyk in 2011 and identified 10 heritage sites within the Noupoort WEF boundary of which 3 sites are in close vicinity to infrastructure. The field work and heritage survey of the infrastructure for the Noupoort WEF as completed by PGS for this report has yielded two further heritage resources that are in close proximity to proposed infrastructure.

The following sites descriptions of site directly impacted by the development were taken directly from the Van Schalkwyk HIA (2011).

2.1.1 Site 6, 8 and 9

Coordinates:

Site 6 - S 31.16832 E 25.05141

Site 8 - S 31.19755 E 25.04126

Site 9 - S 31.19414 E 25.03819

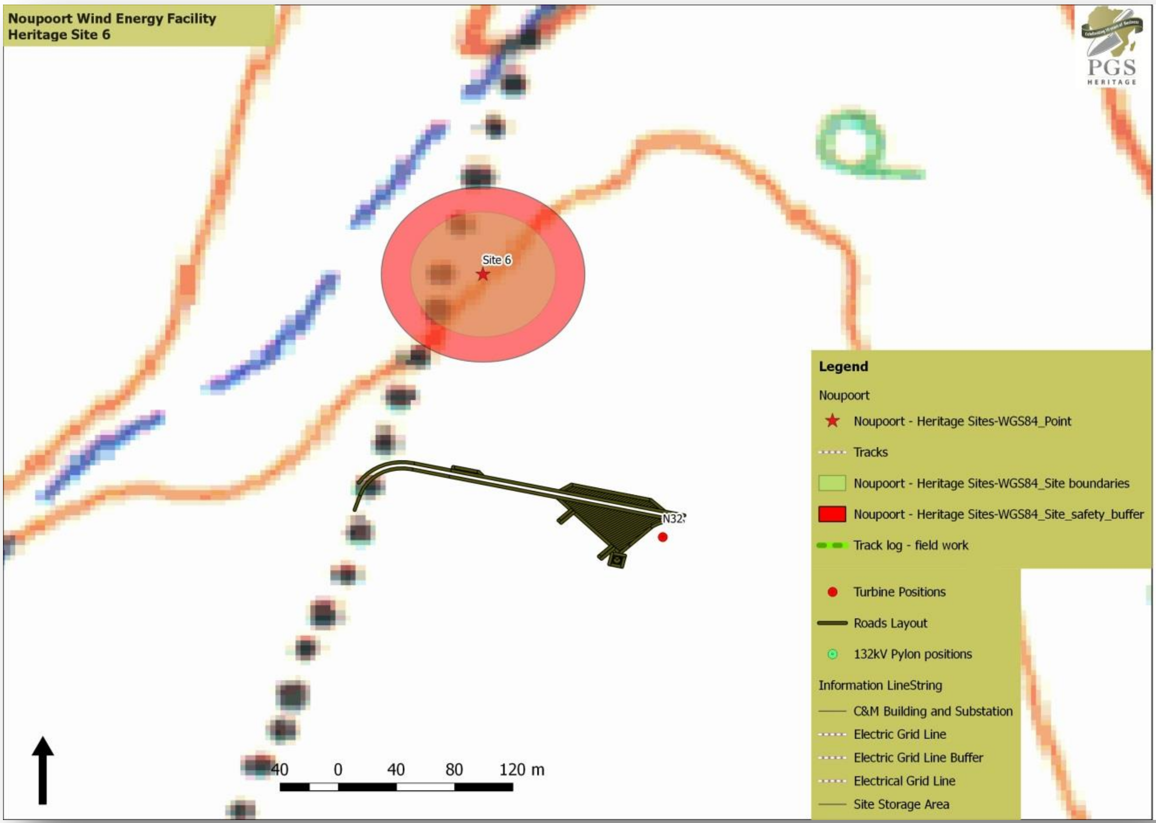


Figure 2 – Site 6 in relation to the WEF infrastructure

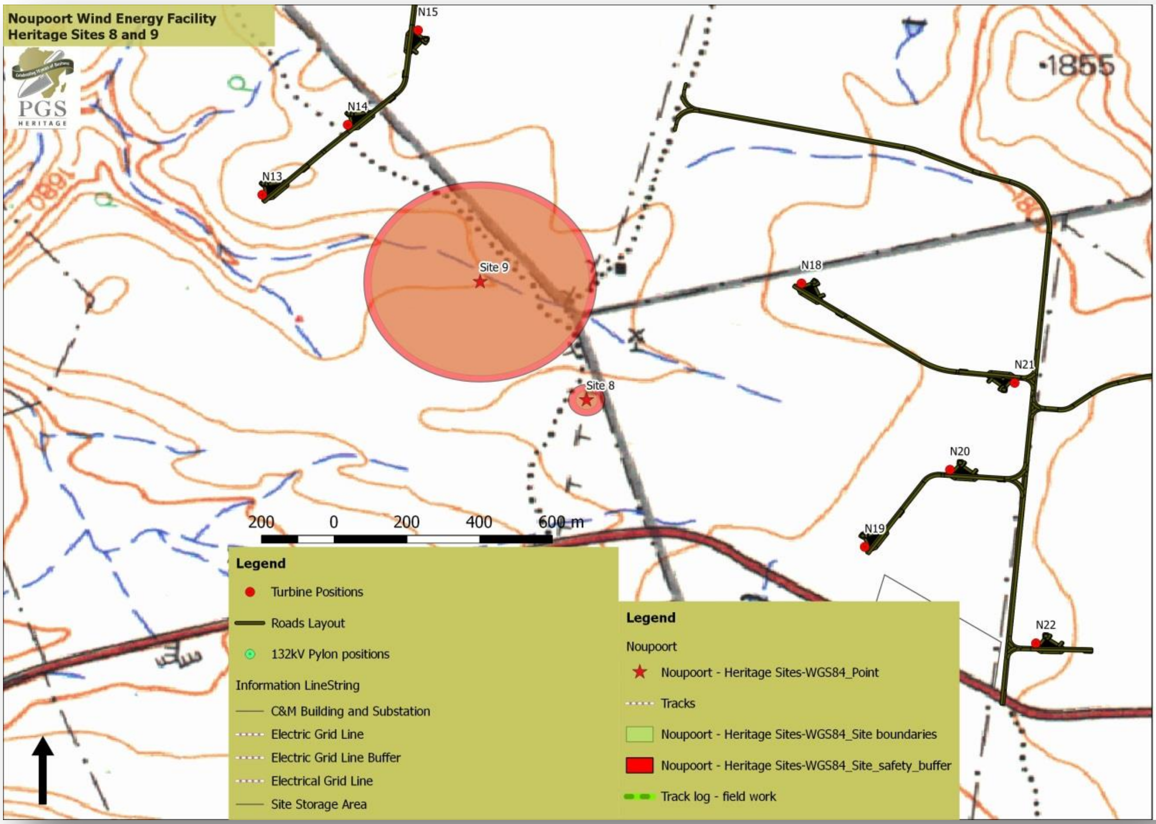


Figure 3 – Site 8 and 9 in relation to the WEF infrastructure

"…According to Mr Lessing, the owner of the farm, these structures were erected by sheep herders who brought the sheep up onto to high areas during the summer, and were vacated during winter when it became too cold. Typically these structures seem to consist of a small area used for sleeping and a larger enclosed space used to keep the sheep in overnight

Heritage Significance rating:

High – Grade 3C

Locality of sites in relation to infrastructure:

Site 6 is situated approximately 150 meter from the closest turbine positions at N32.

Site 8 is situated approximately 800 meter from the closest turbine positions at N18.

Site 9 is a larger stone walled kraal complex and is situated approximately 300 meters from turbines N13 and N14.

2.1.2 Site 11 and 12

Coordinates:

Site 11 - S31.18262 E25.06248

Site 12 - S31.17877 E25.04138

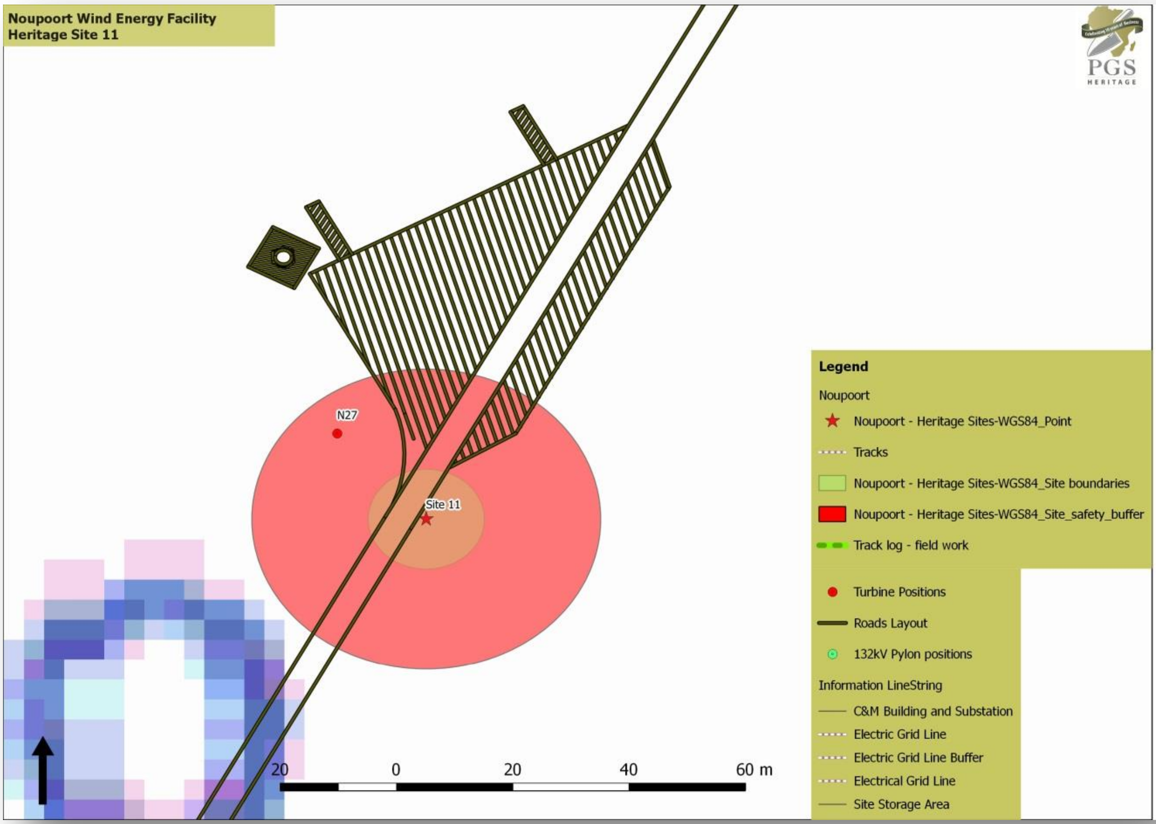


Figure 4 – Locality of Site 11 in relation to the infrastructure

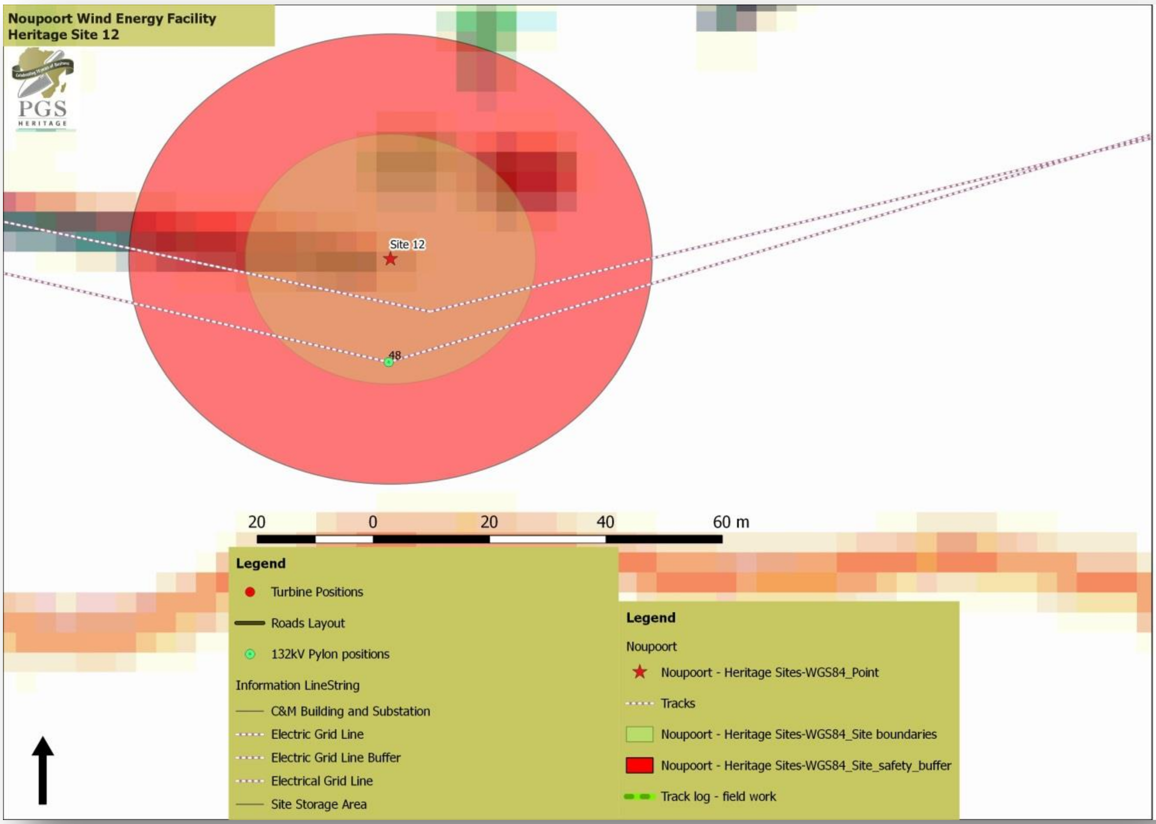


Figure 5 – Locality of Site 12 in relation to the infrastructure

Sites 11 and **12** are both stone walled kraals between 10 and 25 meters in diameter.

Heritage Significance rating:

Both Sites are Graded 3C and is of high local significance. The site is most probably older than 60 years and protected under Section 34 of the national Heritage Resources Act that will require a permit from the Provincial Heritage Authority in the Northern Cape, Ngwao-Boswa Jwa Kapa Bokone, for any alterations to the structure.

Locality of sites in relation to infrastructure:

Site 11 is situated within 20 meters from N27 turbine footprint and access road. The site can possibly be impacted by the construction activities at turbine N27.

Site 12 is situated within in the proposed 132kV servitude and close to pylon 48 of the proposed power line.

Mitigation cost and timeframes:

Mitigation per cost site: Approximately R20 000

Timeframes: 3 months

2.2 Site specific management measures

Table 1 – Site specific management measures (The rows highlighted are site that are in close proximity to the infrastructure)

HERITAGE SITE NUMBER	MITIGATION / MANAGEMENT MEASURE
Site 1 - Farmstead	Site size: 150m x 200m. Demarcate site and include a 10m buffer area. Monitor during construction phases.
Site 2 - Cemetery	Site size: 30m x 30m. Demarcate site and include a 10m buffer area. Monitor during construction phases.
Site 3 - Rock shelter Archaeological site	Site size: 120m x 40m along the river. Demarcate site and include a 50m buffer area. Monitor during construction phases. No person to visit the rock shelters without a guide.
Site 4 - Farmstead	Site size: 100m x 100m. Demarcate site and include a 10m buffer area. Monitor during construction phases.
Site 5 - Stone walled structures	Site size: 50m x 70m. Demarcate site and include a 10m buffer area. Monitor during construction phases.
Site 6 - Stone walled structures	Site size: 50m x 50m. Demarcate site and include a 10m buffer area. Monitor during construction phases.
Site 7 - Stone walled structures	Site size: 80m x 80m. Demarcate site and include a 10m buffer area. Monitor during construction phases.
Site 8 - Stone walled structures	Site size: 30m x 30m. Demarcate site and include a 10m buffer area. Monitor during construction phases.
Site 9 - Stone walled structures	Site size: 300m x 300m. Demarcate site and include a 10m buffer area. Monitor during construction phases.
Site 10 - Stone walled structure	Site size: 10m x 10m. Demarcate site and include a 10m buffer area. Monitor during construction phases.
Site 11 - Stone walled structure	Site size: 10m x 10m. Demarcate the site with a buffer of 20 meters. If this is not possible and the site will be directly impact by the construction activity, the site must be documented and an application

	for a destruction permit be lodged with Ngwao-Boswa Jwa Kapa Bokone for the destruction of the site.
Site 12 - Stone walled structure	Site size: 25m x 25m. Demarcate the site with a buffer of 20 meters. If this is not possible and the site will be directly impact by the construction activity, the site must be documented and an application for a destruction permit be lodged with Ngwao-Boswa Jwa Kapa Bokone for the destruction of the site.

Table 2*: Environmental Management Plan for management of heritage resources:*

Management / Environmental Component:	**EMPr Reference Code:**	
Heritage Resources	EMP-HR	
Primary Objective:		
Minimise impacts on heritage resources through timeous mitigation measures		
Implementation	**Responsibility**	**Resources**
1. Develop heritage training section to include in induction program for employees during construction	Environmental manager	Appointed heritage specialist
2. Development of chance find procedures and an action plan in the case of chance finds of heritage resources .	Environmental manager	Appointed heritage specialist
3. A baseline assessment of the identified heritage sites must be done before construction commences and evaluation of the status of the heritage sites must be done on a bi-monthly basis during construction and a bi-yearly basis during operation of the two sites.	Environmental manager	Appointed heritage specialist
4. Demarcate the identified heritage sites as no-go areas during construction activities.	Environmental manager	ECO, appointed heritage specialist
5. Implement mitigation requirements for Sites 11 and 12 timeously	Environmental manager	ECO, appointed heritage specialist

3 GENERAL HERITAGE MANAGEMENT GUIDELINES FOR IMPLEMENTATION OF MITIGATION MEASURES

As the possibility of the discovery of subsurface archaeological material in the foot print of the construction area have been identified during the HIA the following section pertains to chance finds and the process to be followed.

1. Include an information section on heritage resources in the **SHEQ training** given to contractors involved in earthmoving and trenching activities. These sections must include basic information on:
    a) Heritage;
    b) Graves;
    c) Palaeontology;
    d) Archaeological finds; and
    e) Historical Structures.

    This module must be tailor made to include all possible finds that could be expected in that area of construction, and can be developed by a Heritage Specialist before construction commence.
2. In the event that a possible find is discovered during construction, all activities must be halted in the area of the discovery and a qualified archaeologist contacted.
3. The archaeologist needs to evaluate the finds on site and make recommendations towards possible mitigation measures.
4. If mitigation is necessary, an application for a rescue permit must be lodged with SAHRA.
5. After mitigation, an application must be lodged with SAHRA for a destruction permit. This application must be supported by the mitigation report generated during the rescue excavation. Only after the permit is issued may such a site be destroyed.
6. In the event that human remains are uncovered, or previously unknown graves are discovered, a qualified archaeologist needs to be contacted and an evaluation of the finds made.
8. If the remains are to be exhumed and relocated, the relocation procedures as accepted by SAHRA need to be followed. This includes an extensive social consultation process.

3.1.1 Procedure

In the case where archaeological finds are identified during construction the following measures must be taken:

- Upon the accidental discovery of archaeological finds, a buffer of at least 20 meters should be implemented.
- If archaeological finds are accidentally discovered during construction, activities must cease in the area and a qualified archaeologist be contacted to evaluate the find.
- If the evaluation of the finds require further documentation and mitigation such as excavations, surface collections and/or in situ documentation, a permit must be applied from SAHRA.
- This documentation and mitigation must conform to the guidelines and requirements of SAHRA and international accepted standards and must include as a minimum:
    - *Non-technical summary*

      This should outline in plain, non-technical language the principal reason for the work, its objectives and main results. It should include reference to authorship and commissioning body.

    - *Introductory statements*

      These could include acknowledgements, circumstances of the project such as planning background, the archaeological background, an outline nature of work, the site description (including size, geology and topography, location), when the project was undertaken and by whom.

    - *Aims and objectives*

      These should reflect or reiterate the aims set out in the project design or specification.

    - *Methodology*

      The methods used, including the detail of any variation to the agreed project design or specification should be set out carefully, and explained as appropriate. These should be set out as a series of summary statements, organised clearly in relation to the methods used, and describing structural data, associated finds and/or environmental data recovered. Descriptive material should be clearly separated from interpretative statements. Technical terminology (including dating or period references) should be explained where necessary if the report is aimed at a largely non-archaeological audience. The results should be amplified where necessary by the use of drawings and photographs; and by supporting data contained in appendices (below).

- *Conclusions*

  It is appropriate to include a section, which sums up and interprets the results and puts them into context (local, national or otherwise). Other elements should include a confidence rating on techniques used, or on limitations imposed by particular factors (e.g. weather or problems of access).

- Archive location

  The final destination of the archive (records and finds) should be noted in the report.

- *Appendices*

  These should contain essential technical and supporting detail, including for example lists of artefacts and contexts or details of measurements, gazetteers etc. It may also be appropriate to include the project design or specification for ease of reference.

- *Illustrations*

  Most reports will need the inclusion of one or more illustrations for clarity; as a minimum a location plan should be included. Any plans or sections should be clearly numbered and easily referenced to the National Grid and related to the specified area.

- *References and bibliography*

  A list of all sources used should be appended to the report.

- *Other*

  Contents list, disclaimers.

3.1.2 Procedure for discovery of human remains / graves

In the case where a grave is identified during construction the following measures must be taken:

- Upon the accidental discovery of graves, a buffer of at least 20 meters should be implemented.
- If graves are accidentally discovered during construction, activities must cease in the area and a qualified archaeologist be contacted to evaluate the find. To remove the remains a permit must be applied for from SAHRA and other relevant authorities. The local South African Police Services must immediately be notified of the find.
- Where it is recommended that the graves be relocated, a full grave relocation process that includes comprehensive social consultation must be followed.

The grave relocation process must include:

i. A detailed social consultation process, that will trace the next-of-kin and obtain their consent for the relocation of the graves, that will be at least 60 days in length;
ii. Site notices indicating the intent of the relocation;
iii. Newspaper notices indicating the intent of the relocation;
iv. A permit from the local authority;
v. A permit from the Provincial Department of Health;
vi. A permit from the South African Heritage Resources Agency, if the graves are older than 60 years or unidentified and thus presumed older than 60 years;
vii. An exhumation process that keeps the dignity of the remains intact;
viii. The whole process must be done by a reputable company that is well versed in relocations;
ix. The exhumation process must be conducted in such a manner as to safeguard the legal rights of the families as well as that of the developing company.

4 SOURCES USED

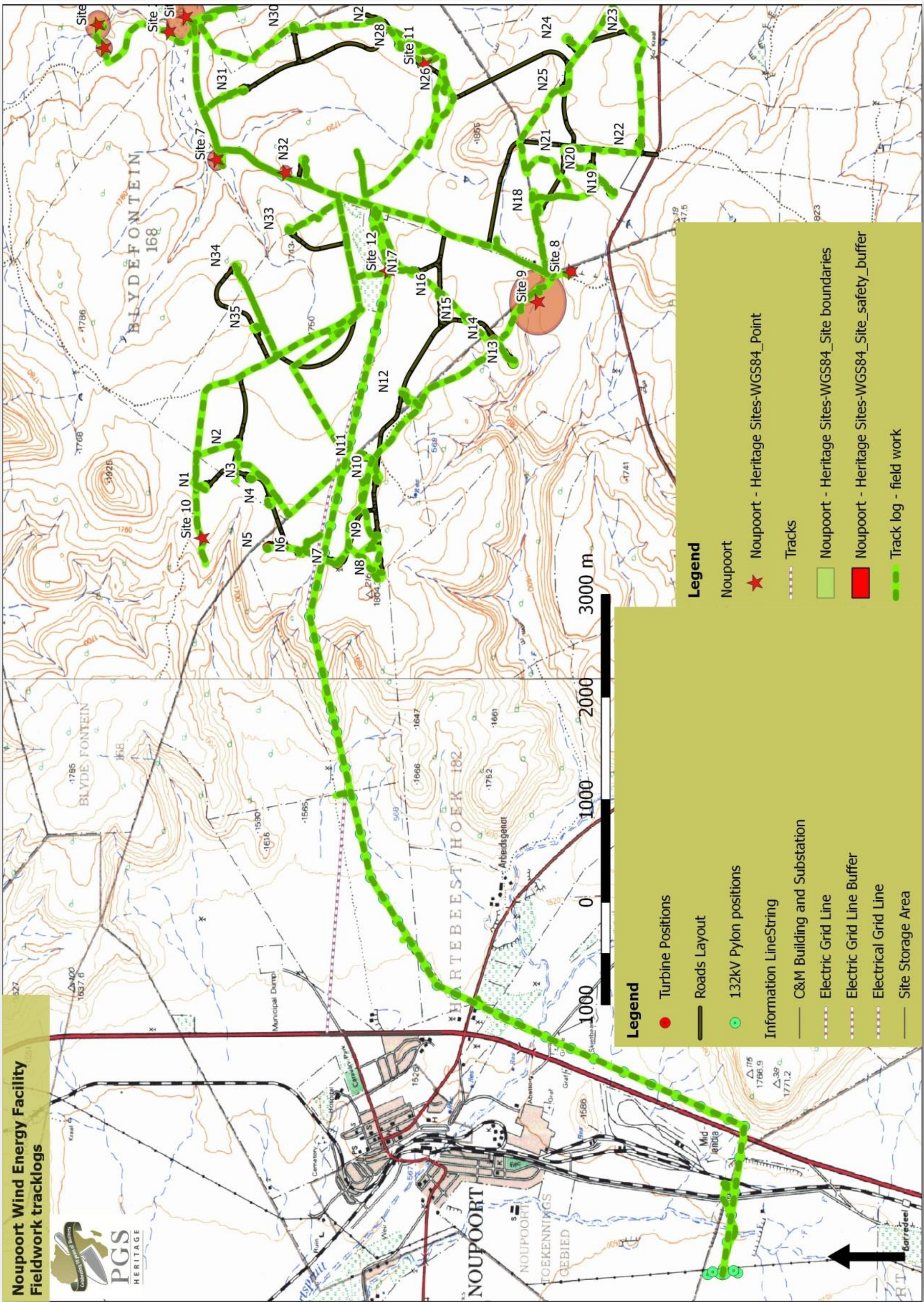
Fourie, W. 2008. Archaeological Impact Assessments within South African Legislation. South African Archaeological Bulletin, 63(187), pp. 77-85.

The Institute of Field Archaeologists, 2001. STANDARD AND GUIDANCE - for an archaeological watching brief. United Kingdom

Van Schalkwyk, J.A., 2011. Heritage Impact Assessment for the Proposed Establishment of a Wind Farm by Mainstream Renewable Power in the Noupoort Region, Northern Cape Province.

Appendix A

Field work maps



APPENDIX B

HERITAGE ASSESSMENT METHODOLOGY

The section below outlines the assessment methodologies utilised in the study.

The Heritage Management Plan (HMP) report to be compiled by PGS Heritage (PGS) for the proposed Noupoort WEF Utilised the following criteria in evaluation of the heritage resources identified during the HWD.

The significance of heritage sites was based on four main criteria:

- **site integrity** (i.e. primary vs. secondary context),
- **amount of deposit, range of features** (e.g., stonewalling, stone tools and enclosures),
  - Density of scatter (dispersed scatter)
    - Low - <10/50m^2
    - Medium - 10-50/50m^2
    - High - >50/50m^2
- **uniqueness** and
- **potential** to answer present research questions.

Management actions and recommended mitigation, which will result in a reduction in the impact on the sites, will be expressed as follows:

A - No further action necessary;

B - Mapping of the site and controlled sampling required;

C - No-go or mitigation

D - Preserve site, or extensive data collection and mapping of the site; and

E - Preserve site

- Site Significance

Site significance classification standards prescribed by the South African Heritage Resources Agency (2006) and approved by the Association for Southern African Professional Archaeologists (ASAPA) for the Southern African Development Community (SADC) region, were used for the purpose of this report.

Table 1: *Site significance classification standards as prescribed by SAHRA*

FIELD RATING	GRADE	SIGNIFICANCE	RECOMMENDED MITIGATION
National Significance (NS)	Grade 1	-	Conservation; National Site nomination
Provincial Significance (PS)	Grade 2	-	Conservation; Provincial Site nomination
Local Significance (LS)	Grade 3A	High Significance	Conservation; Mitigation not advised
Local Significance (LS)	Grade 3B	High Significance	Mitigation (Part of site should be retained)
Generally Protected A (GP.A)	Grade 4A	High / Medium Significance	Mitigation before destruction
Generally Protected B (GP.B)	Grade 4B	Medium Significance	Recording before destruction
Generally Protected C (GP.A)	Grade 4C	Low Significance	Destruction

Appendix D

Integrated Waste Water Management Plan

WATER USE LICENSE APPLICATION
NOUPOORT WIND ENERGY FACILTY
NORTHERN CAPE PROVINCE, SOUTH AFRICA

Prepared for:
Department of Water Affairs
Bloemfontein
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Applicant:
South Africa Mainstream Renewable Power Noupoort (PTY) Ltd
PO Box 45063
Claremont
7735

MAINSTREAM RENEWABLE POWER SOUTH AFRICA
A joint venture with Genesis Eco-Energy

Prepared by:
Scherman Colloty & Associates
1 Rossini Road , Pari Park
PORT ELIZABETH, 6070

Scherman Colloty and Associates cc
Environmental and Aquatic Management Consulting
(CK 2009/112403/23)

21 January 2013

INTEGRATED WATER AND WASTE MANAGEMENT PLAN
NOUPOORT
NORTHERN CAPE PROVINCE, SOUTH AFRICA

Prepared for:
South Africa Mainstream Renewable Power Noupoort (PTY) Ltd
PO Box 45063
Claremont
7735

Prepared by:
Scherman Colloty & Associates
1 Rossini Road
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Environmental and Aquatic Management Consulting
(CK 2009/112403/23)

Ver 2: 21 Dec 2013

EXECUTIVE SUMMARY

Background

Scherman Colloty & Associates (SC&A) was appointed by South Africa Mainstream Renewable Power Noupoort (PTY) Ltd to conduct the Water Use License Application (WULA) process for the proposed construction of wind farm near Noupoort. Noupoort is situated within the Umsobomvu Local Municipality in the greater Pixley ka Seme District Municipality, Northern Cape Province. Noupoort is approximately 53 km south east of the town of Colesberg, 35km north of Middelburg and 55km south west of Hanover town.

The objective of the project is to develop a wind farm in order to generate electricity to feed into the national grid. The project is also in line with the government's commitment to provide renewable energy as an alternative energy source to those currently utilized.

Purpose of the Integrated Water and Waste Management Plan (IWWMP)

The information presented in this IWWMP report provides the technical support documentation for the Water Use Licence application for Mainstream. The report presents details of the water user, the proposed water use, the catchment and local environment, the legal requirements as well as a summary of the impact assessment.

The IWWMP also presents a proposed Water Management Strategy, which offers mitigatory measures for the all development phases in order to minimise environmental impacts. Effective monitoring methods as well as reporting are also addressed.

The IWWMP is therefore based largely on information from the Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) documents, as well as the WULA information questionnaire and aquatic and floodlines assessments undertaken for the project. The former two documents can be perused for more detailed information regarding the proposed facility.

Description of the affected environment

Noupoort is situated within the Umsobomvu Local Municipality in the greater Pixley ka Seme District Municipality, Northern Cape Province. Noupoort is approximately 53 km south east of the town of Colesberg, 35km north of Middelburg and 55km south west of Hanover town. The town of Noupoort is situated off the N9 highway on the main route from the Eastern Cape to Colesberg on the N1 route. There is an existing railway line which runs alongside the N9.

The total study area of the Noupoort site made up by the three portions of land is approximately 7 632 hectares in size. The descriptions of the three portions of land and the size of each include:

- Remainder of the Farm No.168, Colesberg, Noord Kaap (approx. 4 745.62 ha);
- Portion 1 of the Farm No. 181, Colesberg Noord Kaap (approx. 1 469.99 ha);
- Portion 21 of the Farm No. 182, Colesberg Road, Noord Kaap Harmonie (approx. 1 276.80 ha).

The study area consists of a mix of natural veld and unimproved grassland which is used as grazing land for cattle and sheep. Vast grazing land is interspersed incised river channels, which flow intermittently, are present. Large mountains are present within the study site.

The topography and terrain of the study area has a strong influence on the type of drainage present in the study area. The wider area is set within the context of the Karoo landscape of the South African interior, which is characterised by extensive plains characterised by isolated relief in the form of often flat-topped koppies (mesas) and linear, low dolerite ridges. This is typical of the area to the west and north of Noupoort, but the areas to the south and the east (where the development site is located) mark a significant change in this topography. The area to the east of Noupoort is marked by higher-lying ground, with a number of koppies (mostly notably Oppermanskop) encircling a high-lying plateau in the central parts of the site. The presence of this hilly and incised topography entails that there are a number of much more incised valleys on the site

The study area lies close to the Great Escarpment, and thus the area is situated very close to the continental divide, i.e. the watershed that separates drainage into the Indian Ocean to the south and the east, and the Atlantic Ocean to the west. Thus although the study area falls within the Orange River primary catchment, it is located very close to a few of the upper quaternary catchments of the Fish River Basin. The study area is bisected by the divide between two quaternary catchments, with westward-drainage in the western part of the site (streams draining down the steep rising ground on the site to the flats to the east) falling into the D32G catchment (that of the Noupoort Spruit), and the remainder of the site falling into the D34B catchment (drained by the Oorlogspoort Spruit). The Noupoort Spruit becomes a tributary of the perennial Seekoei River, which in turn flows northwards into the Upper Orange River. The Oorlogspoort Spruit itself is perennial and is a tributary of the Upper Orange. Over most of the site, drainage is to the east into the Diepkloof Spruit which rises on the site and drains through a highly incised valley on the site onto the flats to the east of the site where it joins the Oorlogspoort Spruit.

A detailed water resource assessment was conducted by Sivest during the EIA, which was then followed by an additional assessment by SC&A, with respect to meeting the information needs of the WULA. Based on information from the SC&A study, the proposed wind farm layout was amended in order to minimise the number of Section 21 c & i applications, i.e. any of the proposed infrastructure is located outside of the 32m riverine buffer, 50m wetland buffer and 1:100 year floodline, where applicable.

Description of the proposed Wind Energy Facility
The project is likely to comprise of the following components:

- A maximum of 35 wind turbines to achieve a final capacity of 80 MW.
- Foundations to support the turbine towers and hardstand areas next to each turbine. Next to each turbine there will also be a unit transformer which forms part of the hardstand.
- The wind turbines will be connected to each other and to the substation using buried (up to a 1m depth) medium voltage cables except where a technical assessment of the proposed design suggests that overhead lines are appropriate such as over rivers and gullies. Where overhead power lines are to be constructed, monopole tower structures will be used.
- A substation (100 x 100 m) within the development site and will be located on the farm Blydefontein.
- Internal access gravel roads (up to 6 - 10m wide) from the site on to the main road and between the individual turbines.
- An internal road network to the turbines and other infrastructure incl. turning circles for large trucks, Passing points and culverts over gullies and rivers if required, and existing roads will be upgraded.
- A temporary construction laydown area including an access route and a contractor's site office area of up to 5 000 m².

Summary of proposed water use (source, storage, wastewater)

Water demand:
A total allocation of approximately **100 000 m³** will be required over 12 – 18 months for the construction phase. The water will be used for the construction of gravel roads (internal wind access roads) and mass earthworks. During the operational phase, the total annual water demand will be approximately **500 m³**.

Water supply:
During the construction phase, water will be supplied from an existing borehole on the Farm Blydefontein (S31.195710 , E25.041598). A Service Level Agreement has been

signed between South African Mainstream Renewable Power Noupoort (Pty) Ltd and the landowner, confirming their agreement to provide, supply and make available raw water for the purpose of this project. Water for construction purposes (e.g. mass earthworks and roads) will be transferred from the source to the point of use on the site via tanker. Potable water for human consumption will be obtained from the same source, which may either be stored in a mobile storage system. All storage of water will be well below trigger levels. A Non-binding letter has been received from the Department of Water Affairs, Northern Cape Region, indicating that sufficient groundwater is available within the groundwater area from which water will be sourced.

Once construction and commissioning is complete, the wind farm will begin to produce electricity for a period of 20 years. It is worth noting that modern day wind turbines require only relatively small amounts of regular maintenance which will be handled by our operations and maintenance team with many functions being able to be monitored remotely.

Anticipated water usage for the operations stage is estimated to be in the range of 500 kilolitres per annum purely for domestic water purposes e.g. sanitation, washing and drinking. It is worth highlighting that, as a technology, Wind power uses less water than almost any other power generation technology.

Wastewater and wastewater treatment facilities:
During the construction phase, wastewater effluent may be generated through the andling and storage of hazardous substances and waste-causing impacts to ground and surface water resources (e.g. watercourse areas). The EIA Construction Environmental Management Plan (CEMP) provides the relevant mitigation measures and monitoring actions required. A detailed Storm Water Management Plan (SWMP) and Final Construction Environmental Management Plant will be designed during project start-up as part of the contractor’s brief.

License application: Section 21(c) and (i)

The following Section 21 applications will be required as shown in Figure 3:

- 2 linear structures (roads and cables) within the 500m WULA zone
- 1 Turbine only
- 1 turbine and hardstand area

No	Structure description	Existing or New Structure	Perennial/non-perennial drainage line or wetland	Structure Type e.g. Culvert or WTG	Start Co-ordinates (S:E)		End Co-ordinates (S:E)		Relevant Application	Length of road (m)
1	WTG. Hardstand and portion of approach road, underground cable	New	Structures within 500m of wetland boundary, not a crossing or near wetland boundary or any related buffers	WTGs, portion of road and hard stand and underground cable, but not a crossing	-31.171184	25.052329	-31.171422	22.053231	Section 21 c	81
2	WTG only	New	Structures within 500m of wetland boundary, not a crossing or near wetland boundary or any related buffers	WTGs, portion of road but not a crossing	-31.199499	25.056198	-31.199826	25.055963	Section 21 c	45
3	Approach road (portion of crane turning area / crane pad	New	Structures within 500m of wetland boundary, not a crossing or near wetland boundary or any related buffers	Road upgrade only	-31.203275	25.0551	-31.203188	25.055174	Section 21 c	12
4	WTG. Hardstand and portion of approach road, underground cable	New	Structures within 500m of wetland boundary, not a crossing or near wetland boundary or any related buffers	WTGs, portion of road and hard stand and underground cable, but not a crossing	-31.200807	25.065249	-31.20366	25.065735	Section 21 c	236

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List of Acronyms and Abbreviations

CBAs	Critical Biodiversity Areas
CD: RDM	Chief Directorate: Resource Directed Measures
CEMP	Construction Environmental Management Plan
DAFF	Department of Agriculture, Fisheries and Forestry
D: NWRP	Directorate: National Water Resource Planning
DEA	Department of Environmental Affairs
DEA&DP	Department of Environmental Affairs & Development Planning
DoE	Department of Energy
DWA	Department of Water Affairs (post April 2010; previously DWAF)
DWAF	Department of Water Affairs and Forestry
ECO	Environmental Control Officer
EFR	Ecological Flow Requirements
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EWR	Ecological Water Requirements
FIT	Feed-in Tariffs
GIS	Geographical Information Systems
GWh	Giga Watt Hour
HDIs	Historically Disadvantaged Individuals
IUCN	International Union for Conservation of Nature
IWWMP	Integrated Water and Waste Management Plan
km^2	Square kilometres
kV	Kilovolt
MAR	Mean Annual Rainfall
m^2	Square meters
m/s	Meters per second
MW	Mega Watt
MRU	Management Resource Unit
NERSA	National Energy Regulator of South Africa
PES	Present Ecological State
RDM	Resource Directed Measures
REC	Recommended Ecological Category
REFIT	Renewable Energy Feed In Tariffs
SABS	South African Bureau of Standards
SANBI	South African National Biodiversity Institute
SC&A	Scherman Colloty & Associates
SPV	Special Purpose Vehicle
SWMP	Storm Water Management Plan
TPCs	Thresholds of Potential Concern
WARMS	Water use Authorisation and Registration Management System
WCDM	Water Conservation Demand Management
WEF	Wind Energy Facility
WMA	Water Management Area
WTG	Wind Turbine Generators
WULA	Water Use License Application

1. INTRODUCTION

South Africa Mainstream Renewable Noupoort (Pty) Ltd (hereafter referred to as Mainstream) appointed Sivest to undertake the EIA process for the proposed construction of a wind farm near Noupoort, Northern Cape Province, South Africa. The objective of the project is to develop a wind farm in order to generate electricity to feed into the national grid. The project is also in line with the government's commitment to provide renewable energy as an alternative energy source to those currently utilized and in line with the IRP 2010.

A maximum of thirty five (35) Wind Turbine Generators (WTGs), collectively referred to as the WEF, are planned to be constructed over an area of approximately 10 hectares in extent, including the hard standing areas. These will be appropriately spaced to make use of the wind resource on the site.

This wind farm project is considered a Category B project, according to the Equator Principle rating system. Category B Projects are those with potential limited adverse social or environmental impacts that are few in number, generally site-specific, largely reversible and readily addressed through mitigation measures (Equator Principles, 2006).

Associated infrastructure proposed includes:

1. A maximum of 35 Wind Turbines.
2. Foundations to support the turbine towers and hardstand areas next to each turbine. Next to each turbine there will also be a unit transformer which forms part of the hardstand.
3. The wind turbines will be connected to each other and to the substation using buried (up to a 1m depth) medium voltage cables except where a technical assessment of the proposed design suggests that overhead lines are appropriate such as over rivers and gullies. Where overhead power lines are to be constructed, monopole tower structures will be used.
4. A substation (100 x 100 m) within the development site and will be located on the farm Blydefontein.
5. Internal access gravel roads (up to 6 - 10m wide) from the site on to the main road and between individual gravel roads.
6. An internal road network to the turbines and other infrastructure incl. turning circles for large trucks, Passing points and culverts over gullies and rivers if required, and existing roads will be upgraded.
7. A temporary construction laydown area including an access route and a contractor's site office area of up to 5 000 m².

This report, the Integrated Water and Waste Management Plan (IWWMP), will outline the development details for the proposed wind farm near Noupoort and the estimated water requirements for the development. Any potential environmental impacts will be highlighted and mitigatory measures that may prevent or minimise such impacts will be provided. The IWWMP is therefore based largely on information from the Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) documents, as well as the post EIA WULA Section 21 information questionnaire and wetland assessment undertaken for the project by Scherman, Colloty and Associates. The EIA is attached to this application and can be perused for more detailed information regarding the proposed facility.

Together with all other required documentation, the IWWMP forms the Integrated Water Use License Application for the proposed construction of wind farms near Noupoort.

2. IWWMP OBJECTIVES

In line with the purposes intended by the Department of Environmental Affairs (DEA), this Integrated Water and Waste Management Plan (IWWMP) aims to provide "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 or mitigated, and that the positive benefits of the projects are enhanced" (Department of Environmental Affairs and Development Planning, 2005).

By presenting detailed water use activities associated with the construction of wind farms near Noupoort in the appropriate legislative context, providing a summary of the potential environmental impacts specific to water resources and reiterating the mitigation measures prescribed in the EIA process, this document will assist in decision making towards the sustainable use of the country's water resources.

More specific objectives for this IWWMP include:

- providing a detailed description of the required water use and the intended sources of water;
- prescribing mitigation measures for the project in order to minimise potential environmental impacts, particularly on water resources, that are associated with the proposed construction of wind farms near Noupoort;
- identifying specific roles and responsibilities for the implementation of the measures; and
- providing methods statements on storm water management, rehabilitation measures and monitoring.

3. DETAILS OF THE WATER USER

3.1. South Africa Mainstream Renewable Power Noupoort (Pty) Ltd Reg no. 2011/135143/07

The Special Purpose Vehicle (SPV/ applicant) will fully comply with the requirements of the IPPPPP bid criteria (including BEE ownership). See below shareholding. **This information is highly confidential and supplied to the Department of Water Affairs for the purpose of this application only.**

Member	Luxembourg Mainstream Renewable Power SARL	Old Mutual Life Assurance Company South Africa	Genesis Noupoort Wind (Pty) Ltd.	Old Mutual Life Assurance Company South Africa	Thebe Investment Corporation	The Noupoort Renewable Energy Community Trust
					65.86% Black	100% Black
Shareholding	40.00%	25.00%	15.00%	5.00%	10.00%	5.00%
		OMIGSA IDEAS Fund		Futuregrowth Asset Management		

3.2. Section 27 Motivation

The information requirements shown in the text box below are stipulated in the NWA (Act No. 36 of 1998), in order for the water use licence application to be assessed in terms of departmental policies regarding equity, redress, and the economic empowerment of Historically Disadvantaged Individuals (HDIs). The shaded points are covered below, while points (e), (f), (g) and (j) are addressed elsewhere in the document.

The National Water Act, 1998 (Act No. 36 of 1998)
27. (1) (a) existing lawful water uses; (b) the need to redress the results of past racial and gender discrimination (c) efficient and beneficial use of water in the public interest (d) the socio-economic impact of the issuing or refusal of the licence (e) any catchment management strategy applicable to the water resource (f) the likely effect of the water use to be authorised on the water resource and on other water users (g) the class and the resource quality objectives of the water resource (h) investments already made and to be made by the water user in respect of the water use in question (i) the strategic importance of the water use to be authorised (j) the quality of the water in the resource required for the Reserve and international obligations (k) the probable duration of any undertaking or which a water use is to be authorised.

3.2.1. Existing Lawful Water Uses

South Africa Mainstream Renewable Power Noupoort (PTY) Ltd. does not have any existing rights to extract water from any other sites within or outside of South Africa. However, a Non-Binding letter of water availability has been received from the Department of Water Affairs, Northern Cape Region, confirming the availability of sufficient water for the proposed project's purposes.

3.2.2. Need to Redress Past Discrimination

The project (including shareholding in SPV) will fully comply with the requirements of the REIPPPP and will as a result fully comply with the government's policy and objectives in relation to redressing the discrimination of the past.

All the commitments made which in some cases exceeds minimum requirements in the bid proposal will be adhered to. All the commitments made would be governed by the Implementation Agreement signed with the DOE before financial close. Commitments are made with regards to black ownership of windfarm, community trust ownership of the windfarm, Local content, job creation and skills transfer to black citizens including woman and extensive commitments and funding towards enterprise development and socio economic development in the area of Noupoort over 20 years of the project lifecycle.

One of the land owners where the project would be located is also black and a beneficiary of government's land reform process, this land owner will receive substantial rental income once the project is in operation

3.2.3. Socio-Economic Impacts

The efficient and beneficial use of water in the public interest

The concept of public interest is a very complex one. Under the Water Act, 1956 permits were issued to users provided that they use water beneficially. The use was considered beneficially if the applicant was going to profit. Under the National Water Act, Act 36 of 1998, public interest is a lot broader. The fact that the applicant has to undertake a public participation process, and the public's opinion is to be elicited, means that, at least, the public opinion can be gauged by the response and the comments and concerns received. A full public participation process was undertaken as part of the EIA for the Project. Comments and concerns were incorporated into the final design of the Wind Farm. Most positive impacts are of an economic nature during the construction phase of the proposed project.

Possibility of bringing water in from another source

It is currently not expected that water would need to be brought in for off-site locations

The strategic importance of the water use to be authorised

The purpose of the proposed WEF is to add new capacity for generation of renewable energy to the national electricity mix and to aid in achieving the goal of a 43% share of all new power generation being derived from independent power producers (IPPs), as targeted by the Department of Energy (DoE) in the IRP2010.

Further, the socio-economic benefits, such as job creation and clean energy supply, associated with the proposed wind energy facility will occur if the authorisation is provided. The construction and operational phase will provide employment and business opportunities. In addition to the employment benefits for members from the local community, the expenditure of R1.5 billion during the construction phase will create business opportunities for the regional and local economy.

The benefits related to the generation of electricity from renewable energy resources are explored in further detail in the South Africa REFIT Regulatory Guideline published by NERSA (March 2009), and include: increased energy security, exploitation of our significant renewable energy resource, pollution reduction, climate friendly development, support for international agreements and enhanced status within the international community, employment creation, acceptability to society, protecting the natural foundations of life for future generations and resource saving.

It should be noted that conventional coal-fired plants are major consumers of water during their requisite cooling processes. It is estimated that the achievement of the targets in the Renewable Energy White Paper will result in water savings of approximately 16.5 million kilolitres, when compared with wet cooled conventional power stations, which translates into revenue savings of R26.6 million. As an already water-stressed nation, it is critical that South Africa engages in a variety of water conservation measures, particularly due to the detrimental effects of climate change on water availability.

Failure to authorise

Should the facility not be developed, the benefits related to the generation of electricity from renewable energy resources will not be realised (as indicated above). Failure to approve the water license - for 100 000 m^3 (12 - 18 months construction phase for development of roads and earthworks, i.e. period of water use) and 500 m^3 per annum (operational phase) - will compromise South Africa's ability to achieve targets set for renewable energy resources, while the National electricity grid in the Northern Cape would not benefit from the additional generated power. The option to do nothing in terms of implementing renewable energy projects therefore effectively means the choice to build another form of power generation plant in another location. This would most likely be a coal-fired thermal plant as this is the preferred source in South Africa. The development of a renewable energy source, as promoted by the South African Government, would therefore not be realised, and reliance on fossil fuel energy sources and consequent reduction in CO_2 emissions would not be reduced

Further, a loss in the creation of jobs for the local community will also be experienced and the local economy will not benefit.

3.2.4. Existing Investments

No direct investments in relation to the proposed water use have been made to date. The wind farm developers have, however, invested tens of million Rands on developing the Project to date. Part of the scope of the construction contractors is to build the watercourse crossings that require authorisation (the water use).

3.2.5. Duration of Water Use

The construction phase of the wind energy facility is dependent on the number of turbines to be erected, but can be estimated at one week per turbine. It is therefore estimated that it will take approximately 12 - 18 months to construct and commission the proposed facility, which includes the construction of new access roads and foundations. The operational phase or lifespan of the facility is approximately 20 years.

4. MOTIVATION FOR WATER USE

4.1. Motivation for the Proposed Wind Energy Facility and Designated Site

The key motivation for the proposed wind farms near Noupoort is to supply electricity through sustainable renewable energy i.e. wind energy, as electricity demand in South Africa is placing increasing pressure on the country's existing power generation capacity. South Africa has a growing energy intensive economy, highly reliant on fossil fuels. 93% from coal fired power plants. SA currently has 44,157MWs of power generation capacity installed, with 248 Terawatt hours of electricity consumed annually. Current forecasts by 2025 indicate that SA will need almost twice today's electricity demand, doubling to approximately 80,000MWs. The generation of electricity from wind energy can contribute substantially to meeting this demand.

According to the wind potential layer, developed by Environomics and MetroGIS (2011) for the Strategic Environmental Framework for the Optimal Location of Wind Farms in the Coastal Provinces of South Africa (Phase 1 for REFIT 1), large parts of the Northern Cape region of South Africa have the highest suitability for the selection of wind farm sites. Hence, the selection of the site near Noupoort.

4.1.1. Demand for Renewable Energy

Due to concerns related to climate change and the unsustainable exploitation of natural resources such as gas, oil and coal, countries worldwide are being pressured to increase their share of renewable energy generation. International targets have been set in over 58 countries for the promotion of renewable energy.

South Africa is currently dependent on fossil fuels for its energy needs, which supply about 93% of the country's primary energy needs. Some 75% of the national energy demand (i.e. electrical power included) is provided by coal. Such reliance on fossil fuels contributes significantly to air pollution as well as to the emission of greenhouse gasses. With a growing economy, the demand for energy in South Africa is expected to increase significantly into the future.

It must be remembered that wind energy is plentiful, renewable, widely distributed, clean and reduces greenhouse gas emissions when it displaces fossil-fuel derived from electricity. In this light, renewable wind energy can be seen as desirable.

4.1.2. Renewable Energy in South Africa

According to Eskom, the demand for electricity in South Africa has been growing at approximately 3% per annum. This growing demand, fuelled by increasing economic growth and social development within Southern Africa, is placing increasing pressure on South Africa's existing power generation capacity. Coupled with this, is the growing awareness of environmental impact, climate change and the need for sustainable development. The use

of renewable energy technologies, as one of a mix of technologies needed to meet future energy consumption requirements is being investigated as part of Eskom's long-term strategic planning and research process.
As the demand for electricity grows, there is need to establish new generation capacity in South Africa within the next several years. The technologies may differ in their generation costs, state of commercial development and most importantly, suitability to the South African Environment.

South Africa has two acts that direct the planning and development of the country’s electricity sector:
i. The National Energy Act of 2008 (No. 34 of 2008)
ii. The Electricity Regulation Act (ERA) of 2006 (No. 4 of 2006).

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

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

New Build Options								
	Coal	**Nuclear**	**Import Hydro**	**Gas - CCGT**	**Peak - OCGT**	**Wind**	**CSP**	**Solar PV**
2010	0	0	0	0	0	0	0	0
2011	0	0	0	0	0	0	0	0
2012	0	0	0	0	0	0	0	300
2013	0	0	0	0	0	0	0	300
2014	500	0	0	0	0	400	0	300
2015	500	0	0	0	0	400	0	300
2016	0	0	0	0	0	400	100	300
2017	0	0	0	0	0	400	100	300
2018	0	0	0	0	0	400	100	300
2019	250	0	0	237	0	400	100	300
2020	250	0	0	237	0	400	100	300
2021	250	0	0	237	0	400	100	300
2022	250	0	1143	0	805	400	100	300

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

4.2. Identified Site for the Proposed Wind Energy Facility

According to the wind potential layer, developed by Environomics and MetroGIS (2011) for the Strategic Environmental Framework for the Optimal Location of Wind Farms in the Coastal Provinces of South Africa (Phase 1 for REFIT 1) (Figure 1), large parts of the Northern Cape region of South Africa have the highest suitability for the selection of wind farm sites. Hence, the Northern Cape can in general be seen as ideal for the establishment of wind farms.

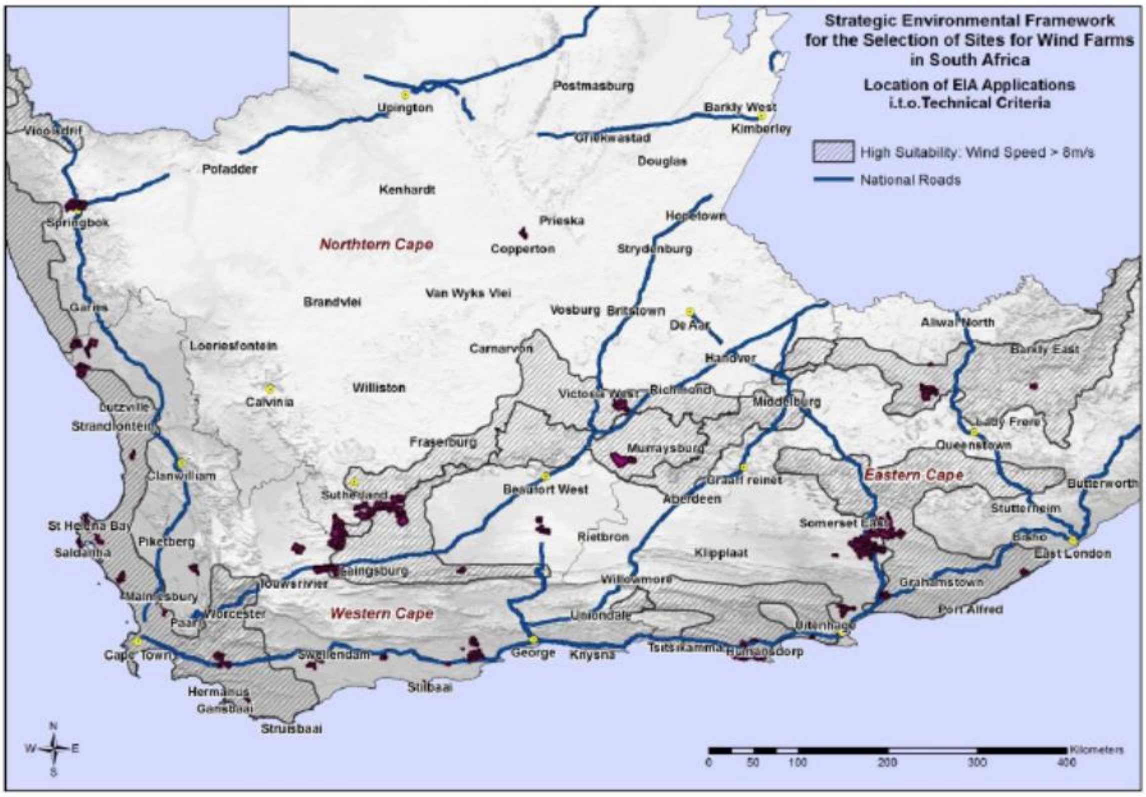

Figure 1: Wind Potential Map (Source: Environomics and MetroGIS, 2011)

4.2.1 Good wind resource

The proponents wind resource map indicated good wind resource. Testing has been conducted over a period of two years using a monitoring masts (70M) erected on site. A SoDar installation on site that measures up to 200m height was also utilised.

Available wind data shows a annual average wind speed of more than 7m/s and a capacity factor of more than 30%.

4.2.2 Grid access

The site is located just east and in close proximity to the Eskom distribution grid. Grid access and grid capacity is therefore not an issue.

4.2.3 Site accessibility

The site is accessible directly off the district road network. Accessibility is therefore not an issue

4.2.4 Fatal flaws

Initial feasibility studies and subsequent environmental study has confirmed no fatal flaws. The Environmental Approval (EA) was thus issued for this development.

4.2.5 Willing land owner

Lease agreements entered into with the land owner, which provided legal entitlement to develop, construct and operate the wind farm

4.2.6 Opportunity for LED and SED in the area

The area is in dire need for employment opportunities. Other sites were considered during the initial feasibility phase, but were eliminated for various reasons. This site was chosen as it fully complied with Mainstreams development criteria.

5. PROPOSED FACILITY

5.1. Proposed Location (Project Footprint)

South Africa Mainstream Renewable Power Noupoort (PTY) Ltd. is proposing to establish a commercial wind energy facility and associated infrastructure on a site located within the Umsobomvu Local Municipality in the greater Pixley ka Seme District Municipality in the Northern Cape Province. Noupoort is a small town in the Northern Cape of South Africa. Noupoort is approximately 53 km south east of the town of Colesberg, 35km north of Middelburg and 55km south west of Hanover town. The town of Noupoort is situated off the N9 highway on the main route from the Eastern Cape to Colesberg on the N1 route.

The total study area of the Noupoort site made up by the three portions of land is approximately 7 632 hectares in size (Figure 2). The proposed site is located on the following farm portions:

- Remainder of the Farm No.168, Colesberg, Noord Kaap (approx. 4 745.62 hectares);
- Portion 1 of the Farm No. 181, Colesberg Noord Kaap (approx. 1 469.99 hectares);
- Portion 21 of the Farm No. 182, Colesberg Road, Noord Kaap Harmonie (approx. 1 276.80 hectares).

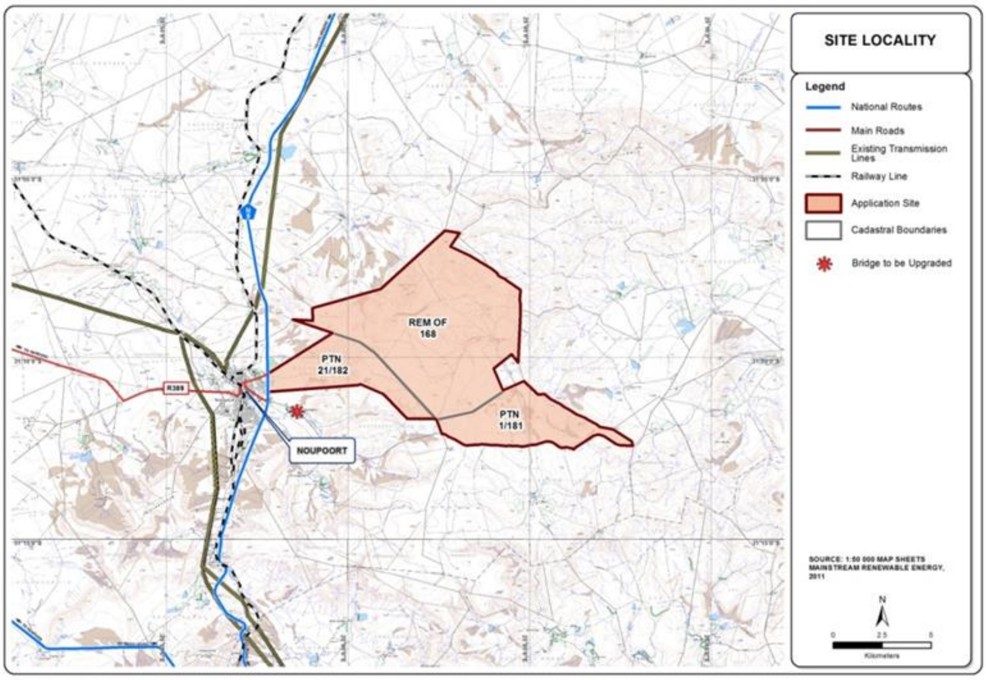

Figure 2: Noupoort site locality map

5.2. Description of Proposed Facility

At this stage, it is estimated that the proposed project will encompass the installation of between 32 and 35 wind turbine generators and their associated components in order to generate electricity that is to be fed into the existing Eskom distribution and / or transmission lines that are located near the proposed site.

The wind turbines will have a hub height of between 80 to 120m and a rotor diameter of 87 to 120m. The blade rotation direction will depend on wind measurement information received later in the process. The rotation will range from 6 to 20 rpm. The foundation of each wind turbine will be approximately 20m x 20m. The footprint for each wind turbine will therefore be approximately 400m².

A hard standing area, of approximately 2 400m², for crane usage will accompany each wind turbine. Hence, the total footprint for each wind turbine and the associated hard standing area will be 2 800m². The foundation will be up to 2.5m deep. It is anticipated at this stage that between 32 and 35 wind turbines will be constructed. The total disturbed footprint for the wind turbines on the affected properties for the Noupoort study site will therefore be approximately 10 hectares excluding the roads. The electrical generation capacity for each turbine will range from a maximum of 2.3 – 2.5 MW depending on the final wind turbine design selected for the proposed development. The total generation capacity for the Noupoort study site is envisaged to be a maximum of 80 MW.

Associated infrastructure includes:

1. A maximum of 35 wind turbines.
2. Foundations to support the turbine towers and hardstand areas next to each turbine. Next to each turbine there will also be a unit transformer which forms part of the hardstand.
3. The wind turbines will be connected to each other and to the substation using buried (up to a 1m depth) medium voltage cables except where a technical assessment of the proposed design suggests that overhead lines are appropriate such as over rivers and gullies. Where overhead power lines are to be constructed, monopole tower structures will be used.
4. A substation (10 x 10 m) within the development site.
5. Internal access gravel roads (up to 6 - 10m wide) from the site on to the main road.
6. An internal road network to the turbines and other infrastructure incl. turning circles for large trucks, Passing points and culverts over gullies and rivers if required, and existing roads will be upgraded.
7. A temporary construction laydown area including an access route and a contractor's site office area of up to 5 000 m².

Workers will be housed off-site, with chemical toilets providing on-site sanitation.

Associated water use (supply, storage) and water related infrastructure:
Water supplies for both the construction and operation phases, i.e. for road construction and mass earth works, will be from an existing borehole to be drilled on the farm Blydefontein (S31.195710, E25.041598). A Service Level Agreement has been signed between South African Mainstream Renewable Power Noupoort (Pty) Ltd and the landowner, confirming their agreement to provide, supply and make available raw water for the purpose of this project. Water will be abstracted from the source and transported via tankers to the point of use. Water for human consumption will be sourced from the same borehole and housed in portable tanks. All storage of water will be well below trigger levels.

5.3. Proposed Layout and Affected Aquatic Resources

Figure 3 indicates the final layout of the proposed Wind Farm, which was generated after the EIA process and during this WULA process in order to reduce infrastructural impacts on existing aquatic resources (i.e. wetland and drainage line areas)

Table 1: The watercourse crossings, structure type and dimensions, including structures proximate to the one wetland on site. Refer to Figure 3a & b for the position of the various structures and the corresponding numbering.

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No	Structure description	Existing or New Structure	Perennial/non-perennial drainage line or wetland	Structure Type e.g. Culvert or WTG	Start Co-ordinates (S:E)		End Co-ordinates (S:E)		Relevant Application	Length of road (m)
1	WTG. Hardstand and portion of approach road, underground cable	New	Structures within 500m of wetland boundary, not a crossing or near wetland boundary or any related buffers	WTGs, portion of road and hard stand and underground cable, but not a crossing	- 31.171184	25.052329	- 31.171422	22.053231	Section 21 c	81
2	WTG only	New	Structures within 500m of wetland boundary, not a crossing or near wetland boundary or any related buffers	WTGs, portion of road but not a crossing	- 31.199499	25.056198	- 31.199826	25.055963	Section 21 c	45
3	Approach road (portion of crane turning area / crane pad	New	Structures within 500m of wetland boundary, not a crossing or near wetland boundary or any related buffers	Road upgrade only	- 31.203275	25.0551	- 31.203188	25.055174	Section 21 c	12
4	WTG. Hardstand and portion of approach road, underground cable	New	Structures within 500m of wetland boundary, not a crossing or near wetland boundary or any related buffers	WTGs, portion of road and hard stand and underground cable, but not a crossing	- 31.200807	25.065249	-31.20366	25.065735	Section 21 c	236

Based on this delineation several structures will require a WULA as they occur within 500 m of a wetland zone or within the 32m buffer of a river or stream.

The following Section 21 applications will be required as shown in Figure 3:

- 1 possible river crossing requiring an upgrade of the current bridge
- 2 linear structures (roads and cables) within the 500m WULA zone
- 1 Turbine only
- 1 turbine and hardstand area

None of the structures are located within the 50m wetland ecological buffer

Note that the turbines are positioned to: utilize maximal wind velocities, be located away from settlements, reduce impacts on agricultural land; and are therefore located in previously disturbed portions of the study area.

The internal access roads are designed to minimise the impact on the wetland, watercourses, water bodies and cultivated land. Watercourse crossings have been avoided where possible and the lengths of internal access roads have been kept to a minimum. All required cable and road crossings are perpendicular to the direction of the drainage line and take the shortest path through sensitive areas (i.e. wetlands and riparian vegetation). The upgraded watercourse crossings will also be designed with erosion protection to minimise erosion. All these mitigation measures relating to the layout were recommended via the EIA and specialist ecological study, as well as during the wetland survey.

Refer to Section 6 for detailed information regarding the water use: supply and storage, which is the subject of this IWWMP.

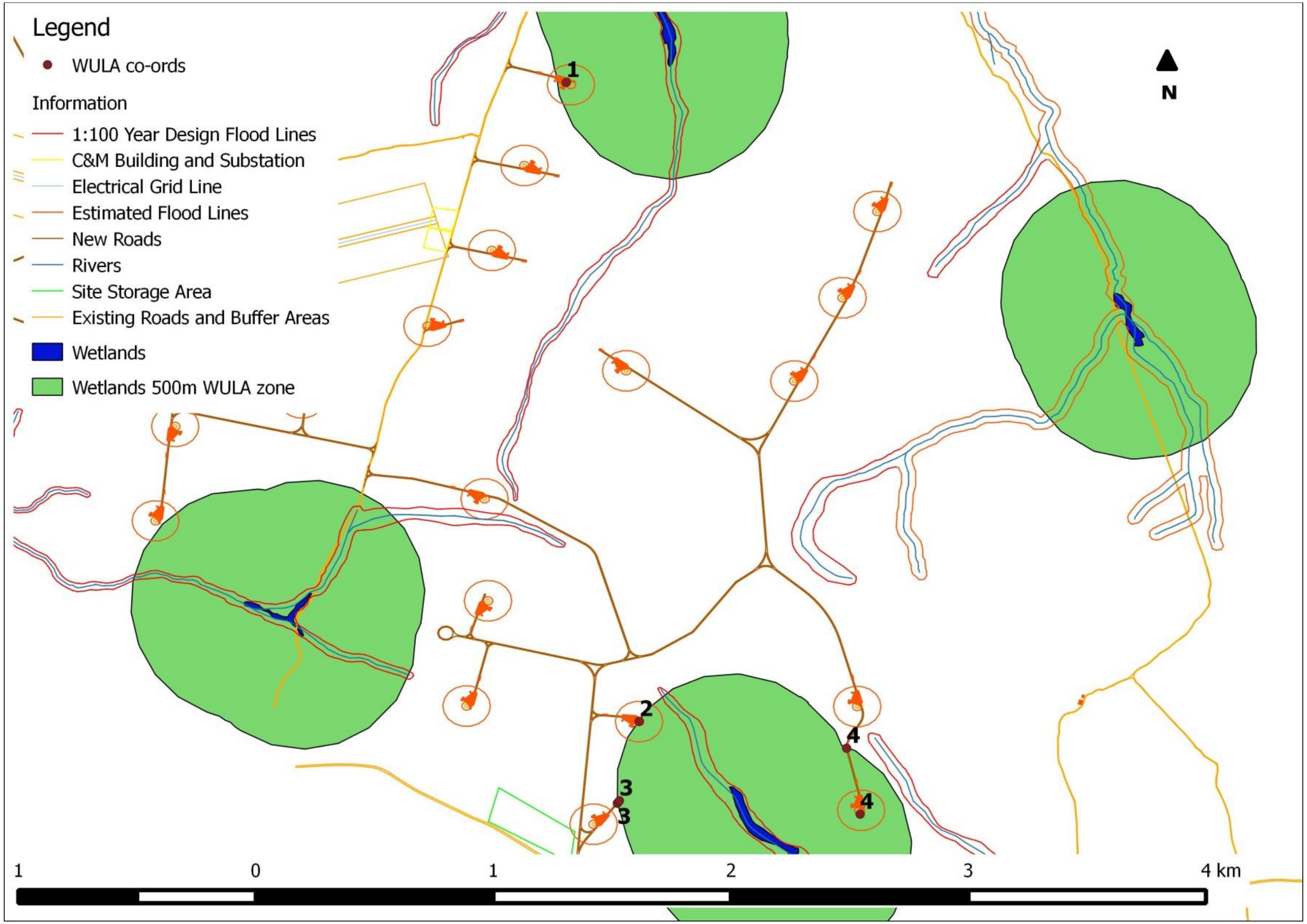

Figure 3: The final layout in relation to the delineated waterbodies and the Water Use License zones

6. DETAILS OF WATER USE

6.1. Water Quantity Requirements: Water Demand

During the construction phase, a total allocation of approximately **100 000 m³** will be required over 12 – 18 months (i.e. the anticipated time of water use) for the construction of roads and mass earthworks. During the operational phase, the total annual water demand will be approximately **500 m³** for a period of 20 years.

6.2. Water Sources and Water Storage

Water supplies for both the construction and operation phases, i.e. for road construction and mass earth works, will be from an existing borehole to be drilled on the farm Blydefontein (S31.195710, E25.041598) and Glen Alan. A Service Level Agreement has been signed between South African Mainstream Renewable Power Noupoort (Pty) Ltd and the landowner, confirming their agreement to provide, supply and make available raw water for the purpose of this project. Water will be abstracted from the source and transported via tankers to the point of use. Water for human consumption will be sourced from the same borehole and housed in a mobile storage system. All storage of water will be well below trigger levels. A Non-binding letter confirming the availability of sufficient water has been received from the Department of Water Affairs.

6.3. Water Transfer and Treatment

Water will be extracted from approved sources and transported by truck and tanker around the site.

6.3.1. Water Quality Requirements

Water for human consumption will be extracted from the same sources as mentioned above, subject to quality compliance.

6.4. Wastewater (Effluent)

Prior to construction a solid and waste water plan will be prepared by the contractor and submitted for approval. Chemical toilets will be used at the turbine sites and at frequent positions (i.e. within 500 m of each active work area) during construction of access roads. Solid waste will be collected and transported off site.

After construction, the permanent staff will use permanent facilities in the centralised control building, serviced by either a septic tank. This is subject to approval by the Department of Water Affairs.

6.4.1. Effluent Storage

Oil will be stored in the construction compound during construction and transformer oil will be stored in the Operations and Maintenance building during operation.

6.4.2. Proposed Sewage Treatment Method

Operational staff will use permanent facilities in the centralised control building, serviced by conservancy or septic tanks. Should the Department of Water Affairs insist on the use of conservancy tanks, Mainstream would be required to further discuss the matter with the local Municipality as their preference is septic tanks. The Municipality doesn't have the required equipment to pump and move waste.

7. OUTLINE OF LEGAL REQUIREMENTS

The Legislative requirements relevant to the proposed wind farm near Noupoort include the following:

- Section 21 of the National Water Act, 1998 (Act No. 36 of 1998)
- GN 399 (26 March 2004): Revision of General Authorisations in terms of Section 39 of the National Water Act, 1998 (Act No. 36 or 1998)
- National Environmental Management Act , 1998 (Act No. 107 of 1998)
- National Environmental: Waste Management Act , 2008 (Act No. 59 of 2008)

A summary of the activities anticipated for the proposed project and the reference to the relevant legislation is presented in Table 7-1 below.

Table 2: Summary of the relevant legislation and the proposed water use activities for the proposed facility

Legislation	Activity Description
The National Water Act, 1998 (Act No. 36 of 1998)	
21. For the purposes of this Act, water use includes (a) taking water from a water resource; (b) storing water; (g) disposing of waste in a manner which may detrimentally impact on a water resource	
GN 399 (26 March 2004) **Revision of General Authorisations in terms of Section 39 of the National Water Act, 1998 (Act No. 36 of 1998)**	
GN 399 1.7 A person who- (c) lawfully has access to land on which the use of water takes place, may: ii take surface water for that property or land as set out in **Table 1.1**, outside of the areas set out in paragraph 1.2	
GN 399 1.7 A person who- (c) lawfully has access to land on which the use of water takes place, may: ii take surface water for that property or land as set out in Table 1.1, outside of the areas set out in paragraph 1.2 above at a rate of 15 litres per second not exceeding **150 000 cubic metres per annum**; and iii subject to Tables 1.3(a) and 1.3(b) store up	**Storage** Possible storage of water for human consumptions in a mobile storage system. All storage of water will be well below trigger levels.

Legislation	Activity Description
to 50 000 cubic metres of water, if the **taking** or storing of water- (aA) does not impact on water resource or any other persons use of water resource, property or land (aB) is not excessive in relation to the capacity of the water resource and the needs of other users (aC) is not detrimental to the health and safety of the public in the vicinity of the activity	
GN 399 1.8 (1) A person who uses water in terms of this authorisation must submit to the responsible authority a **registration** form or any other further information requested in writing by the responsible authority for the registration of the water use before commencement of – (a) Taking more than **50 cubic metres from surface water** or 10 cubic metres from ground water on any given day	
GN 399 **Precautionary practises** 1.9 (2) The water user must follow acceptable construction, maintenance and operational practises to ensure the consistent, effective and safe performance of the taking and storing of water	
GN 399 **Record keeping and disclosure of information** 1.10 (1) The water user must ensure the establishment of monitoring programmes to measure the quantity of water taken and/or stored as follows- (a) The quantity of groundwater or surface water abstracted must be metered or gauged and the total recorded as at the last day of each month	
GN 399 **Inspections** 1.11 Any property or land in respect of which a water use has been authorised in terms of this notice must be available for inspection by an authorised person in terms of section 125 of the National Water Act.	To be conducted as required.
GN 399 *Storage of domestic and/or biodegradable industrial wastewater for the purposes of re-use* 4.7 A person who-	

Legislation	Activity Description
(c) lawfully has access to land on which the use of water takes place, may on that property… (i) Store up to 5 000 cubic metres of domestic and/or biodegradable industrial wastewater for the purposes of re-use, if the storing of the wastewater (aa) does not impact on water resource or any other persons use of water resource, property or land (ab) is not detrimental to the health and safety of the public in the vicinity of the activity	
GN 399 *Storage of domestic and/or biodegradable industrial wastewater for the purposes of disposal* 4.8 A person who- (c) lawfully has access to land on which the use of water takes place, may on that property… (i) Store up to 5 000 cubic metres of domestic and/or biodegradable industrial wastewater for the purposes of disposal of – (aa) up to 10 000 cubic metres per property or land; or (bb) up to 50 000 cubic metres in a waste water pond system per property or land;	Possible storage of water on site anticipated for human consumption
GN 399 *Disposal of domestic and/or biodegradable industrial wastewater* 4.9 A person who- (c) lawfully has access to land on which the use of water takes place, may on that property…dispose of – (i) Up to 1 000 cubic metres of domestic and/or biodegradable industrial wastewater on any given day (bb) into an evaporation pond system	A septic tank may be included, subject to approval from the Department of Water Affairs. Should DWAF insist on a conservancy tank Mainstream will go back to the Municipality and discuss. The Municipality's preference is the use of septic tank as they do not have the required equipment to pump and move waste.

8. DESCRIPTION OF THE ENVIRONMENT

8.1. Key Catchments and Rivers

The study area lies close to the Great Escarpment, and thus the area is situated very close to the continental divide, i.e. the watershed that separates drainage into the Indian Ocean to the south and the east, and the Atlantic Ocean to the west. Thus although the study area falls within the Orange River primary catchment, it is located very close to a few of the upper quaternary catchments of the Fish River Basin. The study area is bisected by the divide between two quaternary catchments, with westward-drainage in the western part of the site (streams draining down the steep rising ground on the site to the flats to the east) falling into the D32G catchment (that of the Noupoort Spruit), and the remainder of the site falling into the D34B catchment (drained by the Oorlogspoort Spruit) – Refer to figure 3 above. The Noupoort Spruit becomes a tributary of the perennial Seekoei River, which in turn flows northwards into the Upper Orange River. The Oorlogspoort Spruit itself is perennial and is a tributary of the Upper Orange. Over most of the site, drainage is to the east into the Diepkloof Spruit which rises on the site and drains through a highly incised valley on the site onto the flats to the east of the site where it joins the Oorlogspoort Spruit.

The bridge over the Noupoort Spruit along the Oorlogspoort Road is proposed to be upgraded or temporarily supported if required to accommodate the vehicles that would need to access to the site.

The existing bridge crosses the Noupoort Spruit near the Aarbeidsgenot Farmstead. The stream drains the higher-lying ground to east and the north, with much of the catchment of the stream falling within the site. The upper parts of the catchment of the stream are thus very hilly and mountainous, being characterised by steep gradients. The gradient flattens out closer to the town and the stream in the vicinity of the bridge is located in this flatter area. The stream appears to be mostly perennial, with flow in the stream observed at the start of the summer season before any significant rain had fallen. The stream has a very well-defined channel in the vicinity of the crossing; upstream of the crossing the stream channel appears to be very incised and possibly subject to accelerated (unnatural) erosion. This has resulted in a high silt load having been deposited just upstream of the bridge behind a low causeway. The causeway appears to have completely silted up as a result. The causeway appears to take advantage of a localised drop in elevation of the stream bed, with the bed of the stream downstream of the bridge being approximately 2.5m lower than the level of the banks just upstream. The stream has a well-defined riparian zone, being characterised by both indigenous riparian trees and shrubs, as well as some exotic species, including the Weeping Willow *Salix babylonica*. The bed of the stream where it is crossed by the bridge is rocky, with outcropping of bedrock evident. A number of typical wetland (hydromorphic) grasses are found in the bed of the channel.

8.1.1. The Present Ecological State (PES) of the Rivers

The Present Ecological State of a river represents the extent to which it has changed from the reference or near pristine condition (Category A) towards a highly impacted system where there has been an extensive loss of natural habit and biota, as well as ecosystem functioning (Category E) – see definitions on Table 3.

Many waterbodies seem almost mono-specific in appearance, dominated by one particular species of grass, reed or sedge. This is not a particularly useful attribute, when wetlands are known for their species richness and biodiversity. Wetland biodiversity is thus related to the associated species such as birds, amphibians and invertebrates, with most due to limited distributions or rapid loss of wetland habitat, are now conservation needy species (Kotze *et al*., 2008). The importance of rare or endangered species is usually used in the promotion of a conservation needy environment. Where this is not possibly a surrogate species of special concern is then used to promote the need for conserving a wetland habitat (e.g. a rare or endemic bird, frog or plant). Recently wetland importance has shifted to the establishing the functional importance or ecosystem services created by a wetland (Kotze *et al*., 2008). This also inferred that the larger the wetland, the more important the system is due to the value it presents in terms of ecological and social services.

The national Present Ecological Score or PES scores are currently being revised for the country, based on new models that will incorporate aspects of functional importance as well as direct and indirect impacts. The new PES system also incorporates EI (Ecological Importance) and ES (Ecological Sensitivity) separately as opposed to EIS (Ecological Importance and Sensitivity) in the old model, although the new model is still heavily centered on rating rivers using broad fish, invertebrate, riparian vegetation and water quality indicators. The Recommended Ecological Category (REC) is still contained within the new models, with the default REC being B, when little or no information is available to assess the system or when only one of the above mentioned parameters is assessed or the overall PES is rated between a C or D. However, the new PES models are still being populated and as yet untested on a national basis. More importantly none of the current rating models apply directly to endorheic depressions

The PES was therefore based on a modified level 3 VEGRAI model (Batchelor, 2009) more suited to the hydrogeomorphic scenarios found within the site.

The Present Ecological State score of the watercourses was there rated as B, based unique nature and the conservation important / sensitivity when compared to other systems. With regard EIS, these wetlands were rated as having a MODERATE sensitivity and importance. The EIS score was based Duthie *et al.* 1999 (as amended), adapted to suite endorheic systems, with limited or no surface flow characteristics and small localised catchments. The EIS was thus rated as B.

The National Freshwater Ecosystem Priority Atlas (NFEPA) went further and classified the conservation importance of the study area systems as A/B (High) based solely on desktop information (Nel *et al*, 2011).

With regard the drainage lines, no assessment could be made using any know methodology due to the type of systems found within the study area i.e. flashy ephemeral systems with little to no aquatic indicators. These based on best judgment and the lack of any major impacts within the area the PES for all these systems would be considered A/B, while the conservation importance would be rated as High (EIS).

Table 3: Generic ecological categories (modified from Kleynhans *et al.*, 2005)

Ecological Category	Description
A	Unmodified, natural.
B	Largely natural with few modifications. A small change in natural habitats and biota may have taken place but the ecosystem functions are essentially unchanged.
C	Moderately modified. Loss and change of natural habitat and biota have occurred, but the basic ecosystem functions are still predominantly unchanged.
D	Largely modified. A large loss of natural habitat, biota and basic ecosystem functions has occurred.
E	Seriously modified. The loss of natural habitat, biota and basic ecosystem functions is extensive.
F	Critically / Extremely modified. Modifications have reached a critical level and the system has been modified completely with an almost complete loss of natural habitat and biota. In the worst instances the basic ecosystem functions have been destroyed and the changes are irreversible.

8.1.2. Catchment vegetation and transformation

All vegetation noted on the site during site visits is included can be found in the Biodiversity Specialist Report.

According to Mucina *et al*. (2006), the proposed wind farm site in Noupoort falls within the following vegetation types: Karoo Escarpment Grassland; Tarkastad Montane Shrubland and Eastern Upper Karoo. While the Karoo Escarpment Grassland and Tarkastad Montane Shrubland are classified Grassland Biome, the Eastern Upper Karoo is classified under the Nama Karoo Biome (Mucina *et al*. 2006). In terms of the conservation status, all vegetation types are considered Least Threatened (Mucina *et al*. (2006).

According to Esler *et al.* (2006), vegetation cover in the study area ranges from 20% to 40% which is relatively low compared to other parts of the country further east. Vegetation cover refers to the percentage of soil overshadowed by plants (Esler *et al*. 2006).

The Karoo Escarpment Grassland vegetation type is characterised by graminoids such as *Aristida congesta, Ehrharta calycina, Eragrostis chloromelas* and *Themeda triandra*; herbs such as *Berkheya pinnatifida, Dianthus caespitosus* and *Senecio asperulus*; Low shrubs such as *Chrysocoma ciliata, Elytropappus rhinocerotis* and *Erica caespitosa*. It is considered to be Least Threatened and only 3% is conserved in statutory conservation areas (Mucina *et a*l. 2006).

The Tarkastad Montane Shrubland is characterised by succulent trees namely Aloe ferox; small trees such as Acacia karroo complex; tall shrubs such as D*iospyros austro-africana; Cadaba aphylla* and *Ehretia rigida*; succulent shrubs namely *Lycium schizocalyx*, *Pachypodium succulentum* and *Sarcocaulon camdeboense*; graminoids such as *Aristida adscensionis* and *Eragrostis chloromelas*; herbs including *Commelina africana* and *Hibiscus pusillus* among others. The vegetation type is considered Least Threatened and about 1-2% is conserved in statutory conservation areas (Mucina *et a*l. 2006). Approximately 2% of the vegetation type is transformed for cultivation or building of dams (Mucina *et al*. 2006).

The Eastern Upper Karoo is characterised by tall shrubs namely Lycium cinereum, L. horridum and L. oxycarpum; low shrubs such as *Chrysocoma ciliata, Pentzia globosa* and *Felicia muricata*; succulent shrubs such as *Euphorbia hypogaea* and *Ruschia intricate*; Herbs namely *Indigofera alternans*, *Pelargonium minimum* and *Tribulus terrestris*; graminoids which include *Aristida congesta, Cynodon incompletes* and *Eragrostis bergiana* (Mucina *et al.* 2006). This vegetation unit is also regarded Least Threatened (Mucina *et al*. 2006). Unspecified portions of the vegetation unit are conserved in statutory conservation areas (Mucina *et al*. 2006).

A species which has been listed as Critically Endangered (Raimondo *et al*), *Marasmodes undulata* Compton has been recorded within the study area. Considering that Renosterbos (*Dicerothamnus rhinocerotis*) the presence of this species being present is possibly however unlikely. The species is extremely rare and was not noted on the site.

Very few exotic species were noted on the site. Those identified were located around the farmsteads that are present and areas closer to town. Essentially the areas located adjacent to anthropogenic activities. Species noted include *Populus nigra var italica*.

Valley bottom wetland along the site access road

The vegetation in the wetland consisted mainly of grass and sedge species, and importantly the wetland showed a very good diversity of species. The primary hydromorphic grass species noted in this part of the wetland were *Agrostis lachnantha*, *Helictotrichon turgidulum*, *Merxmuellera disticha*, *Schoenoplectus corymbosus* and *Perotis patens*.

Valley Bottom Wetland to the south of Blydefontein Farmstead

Vegetation in the wetland channel itself consisted of *Agrostis lachnata* grasses, as well as some aquatic plants that occurred within the water filled channel base. The top of the banks were mostly covered in *Merxmulera disticha* grass, the dominant grass species in the grasslands on the site. The dominance of this grass in this area suggests that erosion over time may have sufficiently lowered the water table on the wetland to allow colonisation of the banks by this grass; but this grass may also be a facultative wetland species. Irrespective of either scenario, the wetland appears to be experiencing accelerated and unnatural levels of erosion due to the movement of cattle in and out of the channel. There was much evidence to suggest that cattle movement up and down the banks, as well as trampling of the vegetation in the channel base is leading to the exposure of soils and their subsequent desiccation and erosion, and in the case of the banks, undercutting that is leading to loss of vegetation.

Diepkloof Stream near the Blydefontein Farmstead

The drainage system is very important for farming activities on the site as it provides water for livestock, grazing, and possibly irrigation water for the nearby lucerne fields. In spite of this heavy human utilisation the Diepkloof Spruit in this area is highly sensitive, due to the perennial availability of water and the very close proximity of a number of micro-habitats, including open water, reedbeds and rocky outcrops.

Stream to the south-west of the Blydefontein Farmstead

Morphologically the wetland appeared to be stable and was well covered with vegetation, predominantly, Miscanthus capensis and Agrostis lachnata grass. The large clumps of the former species were predominant in the wetland and are expected to provide good binding to the wetland soils. A small headcut was noted along a point in the channel. The relative morphological stability of the wetland as observed suggests that this headcut may be a natural feature; rather a product of the relatively steep change in slope along the longitudinal profile of the system than a sign of accelerated erosion. It should be noted that along with all other streams / wetlands observed on the site, cattle were a permanent presence in the wetlands, utilising these systems for both grazing and drinking.

Valley-head Seep on the slopes of Oppermanskop

In addition to the typical Karoo scrubveld vegetation, hydromorphic species in the form of *Agrostis lachnata* grass were encountered along the valley bottom, suggesting that this seepage is a permanent feature. Due to the highly rocky nature of the substrate no sampling of soils was possible, and only very limited occurrence of hydric soils in these and other seeps is expected. Although limited in physical extent, these types of drainage features are likely to exist in similar settings across the site and are sensitive. Collectively, they are likely to be important in stream flow regulation function as they will provide flow input to the streams and wetlands lower down in the catchments.

9. FINDINGS OF THE ENVIRONMENTAL IMPACT ASSESSMENT

The information compiled in this chapter summarises the impacts presented in the EIA conducted by Sivest (Pty) Ltd in relation to the wetlands and watercourses on site. These assessments presented the significance of the positive and negative environmental impacts (direct, indirect, and cumulative) associated with the proposed construction of wind farm near Noupoort.

The impact assessment tables are derived the Surface Water specialist study conducted in February 2012 (Sivest (Pty) Ltd), as part of the EIA process although updated information from the site assessment by Scherman, Colloty & Associates (for the WULA process) is provided as box inserts.

Impact rating for construction activities in, near or through watercourses and associated zones		
Environmental Parameter	Watercourses and Buffer Zones	
Issue/Impact/Environmental Effect/Nature	The construction of the turbines, and the linear associated infrastructure in particular could result in both direct and indirect impacts on surface water features. These activities could result in the physical transformation of surface water features, as well as indirect impacts such as alteration of hydrology regimes, erosion and associated downstream siltation and pollution. taking place in, near or through watercourse areas and associated buffer zones	
Extent	Local/ District	
Probability	Probable	
Reversibility	Partly reversible	
Irreplaceable loss of resources	Significant loss of resources	
Duration	Medium term	
Cumulative effect	Medium cumulative Impact	
Intensity/magnitude	Medium	
Significance Rating	Pre-mitigation significance rating is medium and negative. With appropriate mitigation measures, the impact is likely to be low negative	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	2	1
Probability	3	1
Reversibility	2	2
Irreplaceable loss	3	2
Duration	2	1
Cumulative effect	3	2
Intensity/magnitude	2	1
Significance rating	-30 (medium negative	-9 (low negative)
Mitigation measures	• No turbines to be placed in buffer zones and as little associated infrastructure to be placed in buffer zones as possible • All construction mitigation measures to be adhered to.	

Post EIA watercourse and buffer zone assessment:

All turbines were moved out of the 32m and 50m buffer zones around watercourses and the delineated wetlands (as part of the WULA process).

Impact ratings of construction phase stormwater run-off		
Environmental Parameter	Watercourses and Buffer Zones	
Issue/Impact/Environmental Effect/Nature	Stormwater run-off and consequent erosion impacts to watercourses and associated buffer zones to exposed bare construction areas	
Extent	Site	
Probability	Possible	
Reversibility	Completely Reversible	
Irreplaceable loss of resources	Marginal loss of resources	
Duration	Short term	
Cumulative effect	Medium cumulative Impact	
Intensity/magnitude	Medium	
Significance Rating	Pre-mitigation significance rating is low and negative. With appropriate mitigation measures, the impact is likely to be significantly reduced	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	2	1
Reversibility	1	1
Irreplaceable loss	2	1
Duration	1	1
Cumulative effect	3	1
Intensity/magnitude	2	1
Significance rating	-20 (low negative)	-6 (low negative)
Mitigation measures	**Seasonality of Construction Activities** – Construction activities should take place during summer months when rainfall is at its lowest (preferably between September to March). This will be significant in negating potential run-off impacts from occurring. **Construction Phase Stormwater Management Plan** - The development and implementation of an adequate storm water management plan to be designed by an	

	appropriate engineer will assist in formulating adequate measures to address any potential stormwater impacts from occurring. Here, the engineer should account for both natural run-off (that which can be released into the natural landscape with no detrimental effect) and excess artificial run-off generated over the exposed bare construction laydown areas. In order to prevent acceleration of stormwater run-off, energy dissipating structures can be used. Such structures can reduce the amount and rate of excess run-off generated by the proposed development entering wetlands and thereby prevent the onset of erosion. Stormwater management structures or devices should also take into account the potential for sedimentation and siltation effects associated with stormwater run-off. In this instance, exposed bare areas should be contained by silt fencing or other appropriate devices or materials to trap sediment and dissipate stormwater run-off.

Post EIA watercourse buffer zone assessment:

A Rehabilitation Plan or Method Statement has been compiled for the proposed wind farm. More detail will be provided in the updated EMP will be finalised after financial close and be the responsibility of the contractor to finalised

Impact rating for vehicle damage to watercourses and associated buffer zones during wind turbine and powerline maintenance	
Environmental Parameter	Watercourses and Buffer Zones
Issue/Impact/Environmental Effect/Nature	Vehicle damage to watercourses and buffer zones during maintenance
Extent	Site
Probability	Possible
Reversibility	Partly reversible
Irreplaceable loss of resources	Marginal loss of resources
Duration	Long term
Cumulative effect	Medium cumulative Impact
Intensity/magnitude	Medium
Significance Rating	Pre-mitigation significance rating is low and

	negative. With appropriate mitigation measures, the post mitigation impact rating can be limited	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	2	1
Reversibility	2	1
Irreplaceable loss	2	1
Duration	4	1
Cumulative effect	3	1
Intensity/magnitude	2	1
Significance rating	-28 (low negative)	-6 (low negative)
Mitigation measures	**Use of Existing Roads** - It is crucial that existing roads are used so that damage is limited. Where new access roads are required and the necessary authorisations and licences are obtained (i.e. water use licence and environmental authorisation), these roads must be limited in extent (i.e. go directly to the desired tower) and will need to be maintained. Ideally, if access roads are required inside the watercourses, coarse gravel should be used. This material will not erode away easily after rainfall events and will provide a relatively solid foundation when surface water accumulates. If dirt roads will be the means of access, these will have to be regularly monitored and checked for erosion. Monitoring should be conducted on a weekly to monthly basis. Moreover, after short or long periods of heavy rainfall or after long periods of sustained rainfall, the roads will need to be checked for erosion and the necessary rehabilitation measures will need to be employed. Where erosion begins to take place, this must be dealt with immediately to prevent severe erosion damage to the watercourses and the associated buffer zones. Should large scale erosion occur, a rehabilitation	

	plan will be required. Input from a suitably qualified wetland or aquatic specialist must be obtained.

Post EIA watercourse and buffer zone assessment:

All the powerline tower structures are located 50m outside of the watercourses

Impact rating for stormwater run-off impacts to watercourses and associated buffer zone areas		
Environmental Parameter	Watercourses and Buffer Zones	
Issue/Impact/Environmental Effect/Nature	Stormwater and consequent erosion impacts to watercourses and associated buffer zones	
Extent	Site	
Probability	Probable	
Reversibility	Completely reversible	
Irreplaceable loss of resources	Marginal loss of resources	
Duration	Long term	
Cumulative effect	Medium cumulative Impact	
Intensity/magnitude	Medium	
Significance Rating	Pre-mitigation significance rating is low and negative. With appropriate mitigation measures, the post mitigation impact rating can be limited to a large extent	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	2	1
Reversibility	1	1
Irreplaceable loss	2	1
Duration	3	3
Cumulative effect	3	1
Intensity/magnitude	2	1
Significance rating	-28 (low negative)	-8 (low negative)
Mitigation measures	**Operation Phase Stormwater Management Plan** - The development and implementation of an adequate storm water management plan to be designed by an appropriate engineer for the operation phase of the proposed development will assist in formulating adequate measures to address any potential stormwater impacts from occuring. Here, the engineer should account for both natural run-off (that which can be released into the natural landscape with no detrimental effect) and excess artificial run-off generated over the exposed bare construction laydown areas. In order to prevent acceleration of stormwater run-off, energy dissipating structures can be used. Such structures can reduce the amount and	

	rate of excess run-off generated by the proposed development entering wetlands and thereby prevent the onset of erosion. Stormwater management structures or devices should also take into account the potential for sedimentation and siltation effects associated with stormwater run-off. In this instance, exposed bare areas should be contained by silt fencing or other appropriate devices or materials to trap sediment and dissipate stormwater run-off.

Post EIA watercourse and buffer zone assessment:

All the powerline tower structures are located 50m outside of the watercourses.

Impact rating for removing wind turbines and powerline structures from within or nearby watercourses and the associated buffer zone areas		
Environmental Parameter	Watercourses and Buffer Zones	
Issue/Impact/Environmental Effect/Nature	De-construction activities taking place in, near or through watercourse areas and associated buffer zones	
Extent	Site	
Probability	Possible	
Reversibility	Partly reversible	
Irreplaceable loss of resources	Marginal to significant loss of resources	
Duration	Short term	
Cumulative effect	Medium cumulative Impact	
Intensity/magnitude	Medium	
Significance Rating	Pre-mitigation significance rating is medium and negative. With appropriate mitigation measures, the impact is likely to be negligible.	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	2	4
Reversibility	4	4
Irreplaceable loss	2-3	2
Duration	1	1

Cumulative effect	3	2
Intensity/magnitude	2	1
Significance rating	-26 to -28 (medium negative)	-14 (low negative)
Mitigation measures	**Excavation of Soils from Watercourses and Buffer Zones** – Where appropriate, all removed soils should be backfilled into trenches or excavations. However, where the excavated materials are not suitable, the soils are to be removed from site and dumped at a registered landfill site where sufficient capacity exists. All stockpiled soils from the watercourses and associated buffer zones must be bunded by suitable materials (for example, fixed wooden planks or bricks) that can resist rains and increased run-off. The bunded materials of choice should be high enough to prevent overspill (for example 40-50cm high). This will prevent erosion and sedimentation within the sensitive hydrological systems. Separate stockpiles must be made for topsoil and sub-soils. Once the foundations have been removed, the backfill of excavated soils must be of a suitable soil type to the surrounding area. Additionally, the backfill of soils needs to be done in a manner that re-instates the proper soil horizons in the correct order. For example, the sub-soils must be back filled first and then the topsoil backfill. **Prevention of Pollutants and other potentially Hazardous Substances entering Watercourses and the associated Buffer Zones** – Heavy machinery and vehicles must be checked for oil leaks before being allowed to operate in the watercourse and the associated buffer zone areas. Additionally, no fuelling, re-fuelling or stockpiling of hazardous materials (oils, fuels and cement) is allowed to take place in the cleared vegetation areas prepared for construction activities.	

	Sanitary facilities - Sanitary facilities must be available for workers (at a ratio of 1 toilet to ten workers) to use to prevent urine and faecal waste entering the buffer zones of the wetlands and watercourses. Sanitary facilities must be placed at least 100m from the watercourse and associated buffer zones. **Movement and Degradation of Vehicles and Workers** – Vehicles will be required for the de-construction activities to take place for the wind farm and PV Power Plant. It is important that the lightest possible vehicles and equipment are employed so as to limit damage to the watercourse and associated buffer zone areas. Heavy vehicles with tracks ideally are not to be allowed into the watercourses or the associated buffer zones unless absolutely necessary. Established internal access roads into watercourses and the associated buffer zones will need to be removed and rehabilitated. A site specific rehabilitation plan is to be formulated by a suitably qualified wetland or aquatic specialist and implemented addressing the removal of roads and associated stormwater structures from the watercourse and associated buffer zone areas. This will need to be approved by the relevant environmental determining authority. **Storage of Construction Vehicles, Materials and Equipment** – All vehicles, materials and equipment must be stored at an established de-construction camp away from the watercourse and associated buffer zone areas.

Post EIA watercourse and buffer zone assessment:

A Rehabilitation Plan or Method Statement has been compiled for the proposed wind farm. More detail will be provided in the updated EMP will be finalised after financial close and be the responsibility of the contractor to finalised

Impact rating for decommissioning phase stormwater run-off		
Environmental Parameter	Watercourses and Buffer Zones	
Issue/Impact/Environmental Effect/Nature	Stormwater run-off and consequent erosion impacts to watercourses and associated buffer zones to exposed bare construction areas	
Extent	Site	
Probability	Possible	
Reversibility	Completely reversible	
Irreplaceable loss of resources	Marginal loss of resources	
Duration	Short term	
Cumulative effect	Medium cumulative Impact	
Intensity/magnitude	Medium	
Significance Rating	Pre-mitigation significance rating is low and negative. With appropriate mitigation measures, the impact is likely to be significantly reduced.	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	2	1
Reversibility	1	1
Irreplaceable loss	2	1
Duration	1	1
Cumulative effect	3	1
Intensity/magnitude	2	1
Significance rating	-20 (low negative)	-6 (low negative)
Mitigation measures	**Seasonality of De-construction Activities** – De-construction activities should take place during summer months when rainfall is at its lowest (preferably between September to March). This will be significant in negating potential run-off impacts from occurring. **Decommissioning Phase Stormwater Management Plan** – The development and implementation of an adequate storm water management plan to be designed by an appropriate engineer will assist in formulating adequate measures to address any potential stormwater impacts from occurring. Here, the engineer should account	

	for both natural run-off (that which can be released into the natural landscape with no detrimental effect) and excess artificial run-off generated over the exposed bare construction laydown areas. In order to prevent acceleration of stormwater run-off, energy dissipating structures can be used. Such structures can reduce the amount and rate of excess run-off generated by the proposed development entering wetlands and thereby prevent the onset of erosion. Stormwater management structures or devices should also take into account the potential for sedimentation and siltation effects associated with stormwater run-off. In this instance, exposed bare areas should be contained by silt fencing or other appropriate devices or materials to trap sediment and dissipate stormwater run-off.

Post EIA watercourse and buffer zone assessment:

There may be watercourse crossings (Figure 3). The crossings may be comprised of culverts. Construction details and designs have not been finalised yet. This will be done by the BOP contractor before construction commences. A Rehabilitation Plan or Method Statement has been compiled for the proposed wind farm. More detail will be provided in the updated EMP will be finalised after financial close and be the responsibility of the contractor to finalised

No fish species are found within the wetland or watercourse areas on site due to the non-perennial nature of the watercourses. The watercourse crossings will therefore not impact on fish migration etc.

Concluding Impact Statement

The majority of the potential impacts on wetlands and watercourses associated with the proposed facility are considered low (negative), prior to the implementation of mitigation measures, with three of the impacts assessed as moderate (negative). All impacts however are considered low negative (post mitigation), apart from one positive impact that can be gained if the spread of alien invasive plant species is controlled and rehabilitation implemented. A Rehabilitation Plan or Method Statement has been compiled for the proposed wind farm. More detail will be provided in the updated EMP will be finalised after financial close and be the responsibility of the contractor to finalised

With suitable mitigation and implementation of the final proposed layout (Figure 3), the development should have limited impact on the overall status of the watercourses and the delineated wetlands within the project footprint, including those in the surrounding area.

In conclusion, the proposed wind energy facility is deemed to have a limited potential impact on the aquatic environment.

10.PROPOSED WATER MANAGEMENT STRATEGY

The Environmental Impact Assessment compiled by Sivest (2012) presents an Environmental Management Plan (EMP), providing specific environmental guidance for the construction and operation phases of the project, including measures to "manage and mitigate construction and operation activities so that unnecessary or preventable environmental impacts do not result". The impacts assessed in the EMP included start-up impacts (i.e. site clearing and site establishment), impacts during the construction (i.e. erosion, noise, dust, and visual impacts), impacts during remediation of the site (i.e. soil stabilisation, re-vegetation) and impacts during operation and decommissioning (i.e. similar to construction phase activities).

The following chapter outlining the recommended Water Management Strategy will focus primarily on the management and mitigation of potential impacts to water resources as well as the efficient use of water throughout the project lifecycle (planning, construction, operations and decommissioning).

The development objectives for all phases of development, which correspond to those stipulated in the EMP include:

- ensuring that construction activities are properly managed in respect of environmental aspects and impacts;
- minimising the impact on the indigenous natural vegetation, protected tree species, and habitats of ecological value (i.e. wetland, watercourse areas or drainage lines);
- minimising impacts on fauna using the site; and
- establishing an environmental baseline during construction activities on the site, where possible.

10.1. Roles and Responsibilities

Several professionals will form part of the construction team. The most important from an environmental perspective are the Project Manager (PM), the Environmental Control Officer (ECO) and the main contractor (MC).

The PM is responsible for the implementation of the EMPr on the site during the pre-construction and construction phases of the project.

The ECO is responsible for monitoring the implementation of the EMPr during the design, pre-construction and construction phases of the project.

The MC is responsible for abiding by the mitigation measures of the EMPr which are implemented by the Project Manager during the construction phase.

The MC is also responsible for the implementation of the EMPr during the operational and decommissioning phases of the project.

Project Manager

The PM is responsible for overall management of the project as well as the implementation of the EMPr. The following tasks will fall within his / her responsibilities:

- Be aware of the findings and conclusions of the Environmental Impact Assessment and the conditions stated within the environmental authorisation.
- Be familiar with the recommendations and mitigation measures of this EMPr, and implement these measures.
- Monitor site activities on a daily basis for compliance.
- Conduct internal audits of the construction site against the EMPr.
- Confine the construction site to the demarcated area.
- Rectify transgressions through the implementation of corrective action.

Environmental Control Officer

The ECO is responsible for the implementation of the EMPr during the construction phase and liaison between the Contractor and the Landowners. The ECO will liaise and report to the Contractor, landowners and authorities. The following tasks will fall within his / her responsibilities:

- Be aware of the findings and conclusions of the Environmental Impact Assessment and the conditions stated within the environmental authorisation.
- Be familiar with the recommendations and mitigation measures of this EMPr.
- Conduct monthly audits of the construction site according to the EMPr and EA.
- Educate the construction team about the management measures of the EMPr and EA.
- Regular liaison with the construction team and the project leader.
- Recommend corrective action for any environmental non-compliance incidents on the construction site.
- Compile a regular report highlighting any non-compliance issues. Good compliance with the EMPr will also be noted.
- All negotiations for any reason shall be between the ECO, the affected parties, and the Contractor. No verbal agreements shall be made. All agreements shall be recorded in writing and all parties shall co-sign the documentation.
- The affected parties shall always be kept informed about any changes to the construction programme should they be involved. If the ECO is not on site the Contractor should keep the affected parties informed. The contact numbers of the Contractor and the ECO shall be made available to the affected parties. This will ensure open channels of communication and prompt response to queries and claims.

Main Contractor

The MC is responsible for the implementation and compliance with recommendations and conditions set out in the EMPr.

- Ensure compliance with the EMPr at all times during construction.

- Maintain an environmental register which keeps a record of all incidents which occur on the site during construction. These incidents include:
    - Public involvement / complaints.
    - Health and safety incidents.
    - Hazardous materials stored on site.
    - Non-compliance incidents.
    - The Contractor shall under no circumstances interfere with the property of landowners or nearby communities.

The Environmental Liaison Officer

The Environmental Liaison Officer (ELO) will be appointed by the contractor to monitor activities on site on a daily basis. The ELO will be the ECO's representative on the site and will report back on all audit trips. The ELO must report any major incidents immediately to the ECO

10.2. Management Objectives, Performance Indicators and Monitoring

The EMP (SiVest (Pty) Ltd) presents management objectives along with recommended actions to ensure minimal impacts to the environment. The following section provides the sources of risk, mitigation measures, performance indicators and monitoring recommendations as presented in the EMP, ***with particular emphasis on the efficient management of water resources and water use***.

Note that the license conditions as specified by DWA will be incorporated into the Monitoring Programme and EMP as required and when available.

10.2.1. Construction Phase Impacts

OBJECTIVE: Soil and rock degradation and erosion control, water quality management

Project component/s	Project components affecting the objective: » wind energy turbines » access roads » substation » power line » Sealed surfaces (e.g. roofs, concrete surfaces, compacted road surfaces, paved roads / areas) » All other infrastructure
Potential Impact	» Erosion and soil loss **watercourses/wetland areas** » Negative impacts on **wetlands** » Disturbance to or loss of **wetland/pan habitat** » Sedimentation of **watercourses/wetland areas** » A loss of indigenous vegetation cover, particularly in **watercourse areas** » Increased runoff into drainage lines can potentially be associated with accelerated erosion in **watercourses**
Activities/risk sources	» Rainfall and wind erosion of disturbed areas » Excavation, stockpiling and compaction of soil » Concentrated discharge of water from construction activity » Storm water run-off from sealed surfaces » Mobile construction equipment movement on site » Power line construction activities » **River/stream/drainage line road crossings** » Roadside drainage ditches » Project related infrastructure, such as buildings, turbines and fences
Mitigation: Target/Objective	» To minimise erosion of soil from site during construction » To minimise deposition of soil into drainage lines » To minimise damage to vegetation by erosion or deposition » To minimise damage to rock, soil and vegetation by construction activity » No accelerated overland flow related surface erosion as a result of a loss of vegetation cover » No reduction in the surface area of drainage lines as a result of the establishment of infrastructure » Minimal loss of vegetation cover due to construction related activities » No or insignificant loss of wetland area in the specialist study area » No increase in runoff into drainage lines as a result of construction of project related infrastructure » No increase in runoff into drainage lines as a result of road construction

Mitigation: Action/control	**Responsibility**	**Timeframe**
Identify and demarcate construction areas for general construction work and restrict construction activity to these areas. Prevent unnecessary destructive activity within construction areas (prevent over-excavations	ECO/Contractor	Before and during construction

and double handling)		
Stockpile topsoil for re-use in rehabilitation phase. Maintain stockpile shape and protect from erosion. All stockpiles must be positioned at least 50 m away from drainage lines and wetlands. Limit the height of stockpiles as far as possible in order to reduce compaction.	Contractor	During site establishment and any activity related to earthworks as well as the duration of construction
Any excavation, including those for cables, must be supervised by the ECO.	Contractor	Duration of construction
All cable trenches, etc, through sensitive areas (wetland and watercourse areas) should be excavated carefully in order to minimise damage to surrounding areas.	Contractor	Duration of construction
Disturbance of vegetation and topsoil must be kept to a practical minimum.	Contractor	Duration of contract
New access roads to be carefully planned and constructed to minimise the impacted area and prevent unnecessary excavation, placement and compaction of soil. Special attention to be given to roads that cross drainage lines/watercourses.	Engineer / ECO / Contractor	Before and during construction
Rehabilitate disturbance areas as soon as construction in an area is completed.	Contractor	During and after construction
As far as possible, access to the wind energy facility construction site should be restricted to a single access point.	Contractor	Duration of contract
Internal access roads should be kept to a minimum.	Contractor / ECO	During site establishment
Erosion control measures: Run-off control and attenuation on slopes (sand bags, logs), silt fences, storm water channels and catch-pits, shade nets, soil binding, geofabrics, hydroseeding or mulching over cleared areas.	Engineer / ECO / Contractor	Before construction and
Control depth of excavations and stability of cut faces/sidewalls.	Engineer / ECO / Contractor	maintenance over duration of contract
Compile a comprehensive storm water management plan as part of the final design of the project and implement during construction and operation.	Construction team, management, environmental control officer	Construction & operation
Where access roads cross natural drainage lines, culverts (or other appropriate measures) must be designed to allow free flow. Regular maintenance must be carried out.	Construction team, management, environmental control officer	Construction & operation

Performance Indicator	» No activity in identified no-go areas » Acceptable level of activity within disturbance areas, as determined by ECO » Acceptable level of soil erosion around site, as determined by ECO » Acceptable level of increased siltation in drainage lines, as determined by ECO » Acceptable level of soil degradation, as determined by ECO » Acceptable state of excavations, as determined by ER & ECO
Monitoring	» Fortnightly inspections of the site by ECO » Fortnightly inspections of sediment control devices by ECO » Fortnightly inspections of surroundings, including drainage lines by ECO » Immediate reporting of ineffective sediment control systems » An incident reporting system must record non-conformances to the EMP/IWWMP. » Public complaints register must be developed and maintained on site.

OBJECTIVE: Minimisation of development footprint

In order to minimise impacts on flora, fauna and ecological processes, the development footprint should be limited.

Project component/s	List of project components affecting the objective: » wind energy turbines » access roads » substation » power line
Potential Impact	» Impacts on natural vegetation and habitats, including wetland and watercourse areas. » Impacts on soil in wetland and watercourse areas » Loss of topsoil in wetland and watercourse areas
Activity/risk source	» Site preparation and earthworks » Trenching activities for cable laying » Excavation for tower base foundations » **Construction of site access roads - River/stream/drainage line road crossings** » Site preparation for lay-down area and site office/visitors centre (e.g. compaction) » Foundations or plant equipment installation » Track for crane movement on-site » Power line construction activities » Substation construction activities » Stockpiling of topsoil, subsoil and spoil material
Mitigation: Target/Objective	» To minimise footprints of disturbance of vegetation/habitats on-site » Remove and store all topsoil on areas that are to be excavated; and use this topsoil in subsequent rehabilitation of disturbed areas. » Fill material is to be sourced from tower base excavations; spoil material

	to be minimised.

Mitigation: Action/control	Responsibility	Timeframe
Construction activities must be restricted to demarcated areas so that impact on flora and fauna is restricted.	Contractor	Site establishment & duration of contract
No activity is permitted in identified no go areas (refer to Figure 3).	Contractor	Site establishment & duration of contract
Rehabilitate any disturbed areas immediately after construction in that area is complete in order to stabilise landscapes.	Construction team, management, environmental control officer	Construction & operation

Performance Indicator	» Zero disturbance outside of designated work areas » Minimise loss of topsoil » Minimise clearing of existing natural vegetation
Monitoring	» Observation of vegetation clearing and soil management activities by ECO throughout construction phase. » Supervision of all clearing and earthworks. » An incident reporting system must be used to record non-conformances to the EMP/IWWMP. » Public complaints register must be developed and maintained on site.

OBJECTIVE: Limit Damage to wetland areas and drainage lines

Construction within wetlands and drainage lines must be minimised as far as possible. Where impacts are unavoidable, mitigation measures are required to minimise impacts on these systems.

Project component/s	List of project components affecting the objective: » wind energy turbines » access roads and cabling » power line and associated access road
Potential Impact	» **Damage to wetland areas** by any means that will result in hydrological changes (includes erosion, siltation, dust, direct removal of soil of vegetation, dumping of material within wetlands). The focus should be on the functioning of the wetland as a natural system.
Activity/risk source	» Construction and operation of facility » Construction of access roads
Mitigation: Target/Objective	» No damage to the delineated wetland within project footprint (i.e. no-go area). » Minimise damage to watercourse areas where crossings are built or upgraded.

Mitigation: Action/control	Responsibility	Timeframe

Align underground cables and internal access roads as far as possible along existing infrastructure & disturbances.	Project company, Construction team, ECO	Construction & Operation
Rehabilitate any disturbed areas as soon as possible once construction is completed in an area.	Project company, Construction team, ECO	Construction & Operation
For any new construction where direct impacts on wetlands are unavoidable, cross watercourses perpendicularly to minimise disturbance footprints.	Project company, Construction team, ECO	
Construction must not cause the width of the watercourse to be narrowed.	Project company, Construction team, ECO	Construction & Operation
Control storm water and runoff water through the implementation of a storm water management plan for the site.	Project company, Construction team, ECO	Construction & Operation
Obtain a permit as required in terms of the National Water Act from DWA to impact on any wetland or water resource.	Project company, Construction team, ECO	Construction & Operation

Performance Indicator	» No impacts on water quality, water quantity, wetland vegetation, natural status of watercourses and the wetland.
Monitoring	» Habitat loss in watercourses should be monitored before and after construction. » The presence and development of erosion features downstream of any construction through wetlands must be monitored. » The ECO should be responsible for driving this process. » An incident reporting system must be used to record non-conformances to the EMP/IWWMP. » Public complaints register must be developed and maintained on site.

OBJECTIVE: Protection of indigenous vegetation and control of alien invasive plants

Impacts on vegetation at the construction stage are expected to be mainly as a result of direct permanent loss of vegetation in development footprint areas.

Project component/s	List of project components affecting the objective: » wind energy turbines and associated laydown area » access roads and cabling » temporary laydown areas » substation » power line and associated access roads
Potential Impact	» Loss of vegetation of conservation concern, particularly **riparian/watercourse and wetland vegetation**.

	» Spread of alien species impacting **riparian/watercourse and wetland vegetation**.
Activity/risk source	» Site preparation and earthworks » Construction-related traffic » Foundations » Mobile construction equipment » Power line construction activities » Dumping or damage by construction equipment outside of demarcated construction areas
Mitigation: Target/Objective	» To retain natural vegetation in the highly sensitive areas of the site i.e. **riparian/watercourse and wetland vegetation**. » To minimise footprints of disturbance of vegetation/habitats of **riparian/watercourse and wetland vegetation**. » No alien plants within project control area » No loss of species of conservation concern

Mitigation: Action/control	**Responsibility**	**Timeframe**
Unnecessary impacts on surrounding natural vegetation must be avoided, e.g. driving around in the veld. The construction impacts must be contained to the footprint of the infrastructure.	Construction team, management (ECO)	Construction
Avoid creating conditions in which alien plants may become established: » Keep disturbance of indigenous vegetation to a minimum » Rehabilitate disturbed areas as quickly as possible once construction is complete in an area » Do not import soil from areas with alien plants	Construction team, management (environmental officer)	Construction & Operation
Establish an ongoing monitoring programme to detect and quantify any alien species that may become established and identify the problem species (as per Conservation of Agricultural Resources Act, Act 43 of 1983) and the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004).	Construction team, management (environmental officer), Project company	Construction & Operation
Immediately control any alien plants that become established using registered control methods.	Construction team, management (environmental officer), Project company	Construction & Operation
Internal access roads and underground cables should be aligned as far as possible along existing linear disturbances, e.g. roads on site and away from steep slopes and drainage lines as much as possible. Where new roads are to be constructed, these should follow existing tracks or disturbed areas or the edges of disturbed areas.	Construction team, management (ECO)	Construction / design

Unnecessary impacts on surrounding natural vegetation must be avoided.	Construction team, management (ECO)	Construction
A site rehabilitation programme should be compiled and implemented (See Addendum 1).	Contractor in consultation with Specialist	Duration of contract

Performance Indicator	» Zero disturbance outside of designated work areas. » Minimised clearing of existing/natural vegetation at the watercourse crossings. » No loss of natural vegetation within "no-go" areas e.g. the delineated wetland. Loss of other natural vegetation only within designated footprint of infrastructure. » No significant fragmentation of untransformed areas of natural vegetation (Refer Figure 3: Layout). » No alien infestation within project control area.
Monitoring	» Observation of vegetation clearing activities by ECO throughout construction phase. » Supervision of all clearing and earthworks. » Monitoring of alien plant establishment within the project control area on an on-going basis. » Annual audit of project area and immediate surroundings by qualified botanist. If no species are detected, then this can be stated. If any alien invasive species are detected then the distribution of these should be mapped (GPS co-ordinates of plants or concentrations of plants), number of individuals (whole site or per unit area), age and/or size classes of plants and aerial cover of plants. The results should be interpreted in terms of the risk posed to sensitive habitats within and surrounding the project area. The environmental manager should be responsible for driving this process. Reporting frequency depends on legal compliance framework. » An incident reporting system must be used to record non-conformances to the EMP/IWWMP. » Public complaints register must be developed and maintained on site.

OBJECTIVE: Appropriate handling and storage of chemicals, hazardous substances and waste

The construction phase of the wind energy facility will involve the storage and handling of a variety of chemicals including adhesives, abrasives, oils and lubricants, paints and solvents. The main wastes expected to be generated by the construction of the facility will include **general solid waste, hazardous waste and liquid waste**. A guideline for integrated management of construction waste is included as an Appendix B to the EMP.

Project component/s	List of project components affecting the objective: » wind energy turbines » substation » power line
Potential Impact	**The wetland and watercourse areas could be impacted via:** » Release of contaminated water from contact with spilled chemicals could impact the » Generation of contaminated wastes from used chemical containers » Inefficient use of resources resulting in excessive waste generation » Litter or contamination of the site or water through poor waste management practices
Activity/risk source	» Vehicles associated with site preparation and earthworks » Power line construction activities » Substation construction activities » Packaging and other construction wastes » Hydrocarbon use and storage » Spoil material from excavation, earthworks and site preparation
Mitigation: Target/Objective	» To ensure that the storage and handling of chemicals and hydrocarbons on-site does not cause pollution to the environment or harm to persons » To ensure that the storage and maintenance of machinery on-site does not cause pollution of the environment or harm to persons » To comply with waste management legislation » To minimise production of waste » To ensure appropriate waste storage and disposal » To avoid environmental harm from waste disposal

Mitigation: Action/control	**Responsibility**	**Timeframe**
Storage areas must be located more than 50 m away from the watercourse and wetland.	ECO/Contractor	Before and during construction
The storage of flammable and combustible liquids such as oils must be in designated areas which are appropriately bunded, and stored in compliance with MSDS files, as defined by the SHE Representative / ECO.	Contractor	Duration of contract
Any spills must receive the necessary clean-up action. Bioremediation kits are to be kept on-site and used to remediate any spills that may occur. Appropriate arrangements to be made for appropriate collection and	Contractor	Duration of contract

disposal of all cleaning materials, absorbents and contaminated soils (in accordance with a waste management plan).		
Any storage and disposal permits/approvals which may be required will be obtained, and the conditions attached to such permits and approvals must be complied with.	Contractor	Duration of contract
Routine servicing and maintenance of vehicles is not to take place on-site (except for emergency situations or large cranes which cannot be moved off-site). If repairs of vehicles must take place on site, an appropriate drip tray must be used to contain any fuel or oils.	Contractor	Duration of contract
Transport of all hazardous substances must be in accordance with the relevant legislation and regulations.	Contractor	Duration of contract
Waste disposal records must be available for review at any time.	Contractor	Duration of contract
Construction contractors must provide specific detailed waste management plans to deal with all waste streams.	Contractor	Duration of contract
Specific areas must be designated on-site for the temporary management of various waste streams, i.e. general refuse, construction waste (wood and metal scrap) and contaminated waste. Location of such areas must seek to minimise the potential for impact on the surrounding environment, including prevention of contaminated runoff, seepage and vermin control.	ECO/Contractor	Duration of contract
Where possible, construction and general wastes on-site must be reused or recycled. Bins and skips must be available on-site for collection, separation and storage of waste streams (such as wood, metals, general refuse etc).	Contractor	Duration of contract
Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors.	Contractor	Duration of contract
Hydrocarbon waste must be contained and stored in sealed containers within an appropriately bunded area.	Contractor	Duration of contract
Waste and surplus dangerous goods must be kept to a minimum and must be transported by approved waste transporters to sites designated for their disposal.	Contractor	Duration of contract
Documentation (waste manifest) must be maintained detailing the quantity, nature and fate of any hazardous	Contractor	Duration of contract

waste.		
An incident/complaints register must be established and maintained on-site.	Contractor	Duration of contract
Hazardous and non-hazardous waste must be separated at source. Separate waste collection bins must be provided for this purpose. These bins must be clearly marked and appropriately covered.	Contractors	Erection: during site establishment Maintenance: for duration of Contract within a particular area
All solid waste collected must be disposed of at a registered waste disposal site. A certificate of disposal must be obtained and kept on file. The disposal of waste must be in accordance with all relevant legislation. Under no circumstances may solid waste be burnt or buried on site.	Contractors	Erection: during site establishment Maintenance: for duration of Contract within a particular area
Supply waste collection bins at construction equipment and construction crew camps.	Contractors	Erection: during site establishment Maintenance: for duration of Contract within a particular area
Construction equipment must be refuelled within designated refuelling locations, or where remote refuelling is required, appropriate drip trays must be utilised. *Note that construction will be in the 500m wetland buffers for those turbines, access roads + cables located within or crossing this buffer.*	ECO/Contractor	Duration of contract
All stored fuels to be maintained within a bund and on a sealed surface.	Contractor	Duration of contract
Fuel storage areas must be inspected regularly to ensure bund stability, integrity and function.	Contractor	Duration of contract
Construction machinery must be stored in an appropriately sealed area.	Contractor	Duration of contract
Oily water from bunds at the substation must be removed from site by licensed contractors.	Contractor	Duration of contract
Spilled cement or concrete must be cleaned up as soon as possible and disposed of at a suitably licensed waste disposal site.	Contractor	Duration of contract
Corrective action must be undertaken immediately if a complaint is received, or potential/actual leak or spill of polluting substance identified. This includes stopping the contaminant from further escaping, cleaning up the affected environment as much as practically possible	Contractor	Duration of contract

and implementing preventive measures.		
In the event of a major spill or leak of contaminants, the relevant administering authority must be immediately notified as per the notification of emergencies/incidents.	Contractor	Duration of contract
Any contaminated/polluted soil removed from the site must be disposed of at a licensed hazardous waste disposal facility.	Contractor	Duration of contract
Upon the completion of construction, the area will be cleared of potentially polluting materials.	Contractor	Completion of construction

Performance Indicator	» No chemical spills outside of designated storage areas » No water or soil contamination by chemical spills » No complaints received regarding waste on site or indiscriminate dumping » Internal site audits ensuring that waste segregation, recycling and reuse is occurring appropriately » Provision of all appropriate waste manifests for all waste streams » Designated areas for fires identified on site at the outset of the construction phase » Fire fighting equipment and training provided before the construction phase commences
Monitoring	» Observation and supervision of chemical storage and handling practices and vehicle maintenance throughout construction phase » A complaints register must be maintained, in which any complaints from the community will be logged. Complaints must be investigated and, if appropriate, acted upon » Observation and supervision of waste management practices throughout construction phase » Waste collection to be monitored on a regular basis » Waste documentation completed » An incident reporting system must be used to record non-conformances to the EMP/IWWMP » South Africa Mainstream Renewable Power Noupoort (PTY) Ltd or appointed ECO must monitor indicators listed above to ensure that they have been met for the construction phase. » Public complaints register must be developed and maintained on site.

OBJECTIVE: Ensure disciplined conduct of on-site contractors and workers

In order to minimise impacts on the surrounding environment, Contractors must be required to adopt a certain Code of Conduct and commit to restricting construction activities to areas within the development footprint. Contractors and their sub-contractors must be familiar with the conditions of the Environmental Authorisation (once issued), the EIA Report, and the Final EMP (which will include the conditions in the Water Use License (once issued), as well as the requirements of all relevant environmental legislation.

Project component/s	List of project components affecting the objective: » Wind energy facility and associated infrastructure
Potential Impact	» Pollution/contamination of the environment » Disturbance to the environment and surrounding communities
Activity/risk source	» Contractors are not aware of the requirements of the EMP/IWWMP, leading to unnecessary impacts on the surrounding environment
Mitigation: Target/Objective	» To ensure appropriate management of actions by on-site personnel in order to minimise impacts to the surrounding environment

Mitigation: Action/control	**Responsibility**	**Timeframe**
The EMP and the Environmental Authorisation must be included in all tender documentation and Contractors contracts.	Project company	Tender process
An ECO must be permanently on site throughout the road construction, cable laying, and turbine foundation excavation periods, and at other times <u>should visit the site at least once a week</u>.	Project company	Duration of construction
Contractors must use chemical toilets/ablution facilities situated at designated areas of the site; no abluting must be permitted outside the designated area. These facilities must be regularly serviced by appropriate contractors. These facilities must not be located within 50m from any river, wetland or drainage line.	Contractor (and sub-contractor/s)	Duration of contract
Cooking must take place in a designated area. No firewood or kindling may be gathered from the site or surrounds.	Contractor (and sub-contractor/s)	Duration of contract
All litter must be deposited in a clearly marked, closed, animal-proof disposal bin in the construction area; particular attention needs to be paid to food waste.	Contractor (and sub-contractor/s)	Duration of contract
No one other than the ECO or personnel authorised by the ECO, will disturb flora or fauna outside of the demarcated construction area/s.	Contractor (and sub-contractor/s)	Duration of contract

Performance Indicator	» Compliance with specified conditions of Environmental Authorisation, EIA report and EMP, including the IWWMP and conditions of the Water Use License Authorisation. » No complaints regarding contractor behaviour or habits » Code of Conduct drafted before commencement of construction phase & briefing session with construction workers held at outset of construction phase
Monitoring	» Observation and supervision of Contractor practices throughout construction phase. » A complaints register must be maintained, in which any complaints from

	the community are to be logged. Complaints must be investigated and, if appropriate, acted upon. » An incident reporting system must be used to record non-conformances to the EMP/IWWMP.

OBJECTIVE: To ensure all construction personnel have the appropriate level of environmental awareness and competence to ensure continued environmental due diligence and on-going minimisation of environmental harm

To achieve effective environmental management, it is important that Contractors are aware of the responsibilities in terms of the relevant environmental legislation and the contents of the Final EMP. The Contractor is responsible for informing employees and sub-contractors of their environmental obligations in terms of the environmental specifications, and for ensuring that employees are adequately experienced and properly trained in order to execute the works in a manner that will minimise environmental impacts. The Contractors obligations in this regard include the following in terms of wetland and watercourse impacts:

- Employees must have a basic understanding of the key environmental features of the construction site and the surrounding environment.
- Ensuring that a copy of the Final EMP is readily available on-site.
- Employees will be familiar with the requirements of the Final EMP and the environmental specifications (conditions) as they apply to the construction of the facility.
- Ensure that construction workers have received basic training in environmental management, including the storage and handling of hazardous substances, minimisation of disturbance to sensitive areas (such as wetland and watercourse areas), management of waste, and prevention of water pollution.

OBJECTIVE: To ensure rehabilitation of disturbed areas

Areas requiring rehabilitation will include all areas disturbed during the construction phase and that are not required for regular maintenance operations.

Project component/s	List of project components affecting the objective: Wind energy facility, including access roads (especially across watercourses) and laydown areas » power line servitude and service road for power line servitude » substation » temporary laydown areas
Potential Impact	» Environmental integrity of site undermined resulting in erosion and compromised land capability within the **wetland and watercourse areas** and the requirement for on-going management intervention
Activity/risk source	» Temporary laydown areas » Temporary access roads/tracks » Access roads and underground cabling » Other disturbed areas/footprints

Mitigation: Target/Objective	» To ensure and encourage site rehabilitation of disturbed areas » To ensure that the site is appropriately rehabilitated following the execution of the works, such that residual environmental impacts (including erosion) are remediated or curtailed		
Mitigation: Action/control		**Responsibility**	**Timeframe**
All temporary facilities, equipment and waste materials must be removed from site and appropriately disposed of.		Contractor	Following execution of the works
All temporary fencing and danger tape should be removed once the construction phase has been completed.		Contractor	Following completion of construction activities in an area
Necessary drainage works and anti-erosion measures must be installed, where required, to minimise loss of topsoil and control erosion.		Contractor	Following completion of construction activities in an area
Disturbed areas must be rehabilitated/re-vegetated with appropriate natural vegetation and/or local seed mix. Re-use native/indigenous plant species removed from disturbance areas in the rehabilitation phase.		Contractor in consultation with rehabilitation specialist	Following completion of construction activities in an area
Re-vegetated areas may have to be protected from wind erosion and maintained until an acceptable plant cover has been achieved.		Project company in consultation with rehabilitation specialist	Post-rehabilitation
On-going alien plant monitoring and removal should be undertaken on all areas of natural vegetation on an annual basis.		Project in consultation with rehabilitation specialist	Post-rehabilitation (operation)
Performance Indicator	» All portions of site, including construction camp and working areas, cleared of equipment and temporary facilities » Topsoil replaced on all areas and stabilised » Disturbed areas rehabilitated and acceptable plant cover achieved on rehabilitated sites » Closed site free of erosion and alien invasive plants		
Monitoring	» On-going inspection of rehabilitated areas in order to determine effectiveness of rehabilitation measures implemented » On-going alien plant monitoring and removal should be undertaken on an annual basis » An incident reporting system must be used to record non-conformances to the Final EMP		

10.2.2. Operational Phase Impacts

According to the EMP, an environmental manager should be appointed during operation whose duty it will be to minimise impacts on surrounding sensitive habitats, including wetlands (Sivest 2012).

OBJECTIVE: Protection of indigenous natural vegetation, fauna and maintenance of rehabilitation

Indirect impacts on vegetation and terrestrial fauna during operation could result from maintenance activities and the movement of people and vehicles on site. In order to ensure the long-term environmental integrity of the site following construction, maintenance of the areas rehabilitated (e.g. around and in proximity to watercourse areas) post-construction must be undertaken until these areas have successfully re-established.

Project component/s	» Areas requiring regular maintenance. » Route of the security team. » Areas disturbed during the construction phase and subsequently rehabilitated at its completion		
Potential Impact	» Disturbance to or loss of vegetation and/or habitat **(including wetland and watercourse areas).** » Environmental integrity of site undermined resulting in reduced visual aesthetics, erosion, compromised land capability and the requirement for on-going management intervention.		
Activity/Risk Source	» Movement of employee vehicles within and around site.		
Mitigation: Target/Objective	» Maintain minimised footprints of disturbance of vegetation/habitats on-site. » Ensure and encourage plant re-growth in non-operational areas of post-construction rehabilitation.		
Mitigation: Action/Control		**Responsibility**	**Timeframe**
Vehicle movements must be restricted to designated roadways.		Project company	Operation
Existing roads must be maintained to ensure limited erosion and impact on areas adjacent to roadways.		Project company	Operation
An on-going alien plant monitoring and eradication programme must be implemented, where necessary.		Project company	Operation
A botanist familiar with the vegetation of the area should monitor the rehabilitation success and alien plant removal on an annual basis.		Project company / Specialist	Annual monitoring until successful re-establishment of vegetation in an area
Performance Indicator	» No further disturbance to vegetation or terrestrial faunal habitats, including wetland and watercourse areas. » Continued improvement of rehabilitation efforts.		

Monitoring	» Observation of vegetation on-site by environmental manager. » Regular inspections to monitor plant re-growth/performance of rehabilitation efforts and weed infestation compared to natural/undisturbed areas.

OBJECTIVE: Appropriate handling and management of hazardous substances and waste

The operation of the wind energy facility will involve the generation of limited waste products. The main wastes expected to be generated by the operation activities includes general **solid waste and hazardous waste**.

Project component/s	List of project components affecting the objective: » wind energy turbines » power line » substation		
Potential Impact	» Inefficient use of resources resulting in excessive waste generation » Litter or contamination of the site or water through poor waste management practices		
Activity/risk source	» Generators and gearbox - turbines » Transformers and switchgear - substation » Fuel and oil storage		
Mitigation: Target/Objective	» To comply with waste management legislation » To minimise production of waste » To ensure appropriate waste disposal » To avoid environmental harm from waste disposal		
Mitigation: Action/control		**Responsibility**	**Timeframe**
Hazardous substances must be stored in sealed containers within a clearly demarcated designated area.		Project company	Operation
Storage areas for hazardous substances must be appropriately sealed and bunded.		Project company	Operation
All structures and/or components replaced during maintenance activities must be appropriately disposed of at an appropriately licensed waste disposal site or sold to a recycling merchant for recycling.		Project company	Operation
Care must be taken to ensure that spillage of oils and other hazardous substances are limited during maintenance. Handling of these materials should take place within an appropriately sealed and bunded area. Should any accidental spillage take place, it must be cleaned up according to specified standards regarding bioremediation.		Project company	Operation and maintenance

Waste handling, collection and disposal operations must be managed and controlled by a waste management contractor.	Project company / waste management contractor	Operation
Used oils and chemicals: » Where these cannot be recycled, appropriate disposal must be arranged with a licensed facility in consultation with the administering authority. » Waste must be stored and handled according to the relevant legislation and regulations.	Project company	Operation
General waste must be recycled where possible or disposed of at an appropriately licensed landfill.	Project company	Operation
Hazardous waste (including hydrocarbons) and general waste must be stored and disposed of separately.	Project company	Operation
Disposal of waste must be in accordance with relevant legislative requirements, including the use of licensed contractors.	Project company	Operation
No waste may be burned or buried on site.	Project company	Operation

Performance Indicator	» No complaints received regarding waste on site or indiscriminate dumping » Internal site audits identifying that waste segregation, recycling and reuse is occurring appropriately » Provision of all appropriate waste manifests » No untreated contamination of soil or water
Monitoring	» Waste collection must be monitored on a regular basis· » Waste documentation must be completed and available for inspection on request » An incidents/complaints register must be maintained, in which any complaints from the community must be logged. Complaints must be investigated and, if appropriate, acted upon » Regular reports on exact quantities of all waste streams exiting the site must be compiled by the waste management contractor and monitored by the Environmental Manager. All appropriate waste disposal certificates accompany the monthly reports.

OBJECTIVE: Minimise the potential impact on farming activities and on the surrounding landowners

Project Component/s	» Possible negative impacts of activities undertaken on site on the activities of surrounding property owners and farming activities e.g. **polluting water sources**.		
Potential Impact	» Limited intrusion impact on surrounding land owners **e.g. environmental pollution occurs (i.e. waste, water and sanitation).** » Interference with farming activities on site **e.g. environmental pollution occurs (i.e. waste, water and sanitation).**		
Activities/Risk Sources	» Operational activities on site could interfere with farming activities of landowner.		
Mitigation: Target/Objective	» Effective management of the facility. » Mitigation of intrusion impacts on property owners. » Mitigation of impact on farming activities.		
Mitigation: Action/Control		**Responsibility**	**Timeframe**
Effective management of the facility and accommodation facility to avoid any **environmental pollution focusing on water, waste and sanitation infrastructure and services.**		Project company	Operation
Performance Indicator	» **No environmental pollution occurs (i.e. waste, water and sanitation).**		
Monitoring and reporting	» The Project Company should be able to demonstrate that the facility is well managed without environmental pollution and that the above requirements have been met.		

10.3. Ecological Monitoring

Ecological monitoring is the collection and analysis of repeated observations or measurements to evaluate changes in the condition of the aquatic resources and the progress towards meeting the management objective (Elzinga *et al.*, 1998).

Ecological monitoring required will presumably be outlined in the license conditions as issued by DWA.

11. REFERENCES

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12.ADDENDUM 1: STORM WATER MANAGEMENT, REHABILITATION PLAN AND MONITORING

The following storm water control measures and rehabilitation specifications are recommended for the Noupoort Wind Farm. The wind farm will include the following infrastructure:

- A maximum of 35 Wind Turbines.
- Foundations to support the turbine towers and hardstand areas next to each turbine. Next to each turbine there will also be a unit transformer which forms part of the hardstand.
- The wind turbines will be connected to each other and to the substation using buried (up to a 1m depth) medium voltage cables except where a technical assessment of the proposed design suggests that overhead lines are appropriate such as over rivers and gullies. Where overhead power lines are to be constructed, monopole tower structures will be used.
- A substation (100 x 100 m) within the development site.
- Internal access gravel roads (up to 6 - 10m wide) from the site on to the main road.
- An internal road network to the turbines and other infrastructure incl. turning circles for large trucks, Passing points and culverts over gullies and rivers if required, and existing roads will be upgraded.
- A temporary construction laydown area including an access route and a contractor’s site office area of up to 5 000 m².

1. STORM WATER MANAGEMENT

<u>As per the WULA Questionnaire:</u>
A comprehensive storm water management plan has been recommended in the EIA and EMP reports.

Refer EIA Report:

- A comprehensive storm water management plan should be compiled for the facility footprint prior to construction.

According to the EIA report, the storm water management plan should be compiled to reduce impacts on wetlands:

- Nature: Impacts on Wetlands (page 89)

<u>General</u>

- The following document should be consulted for further support with respect to information regarding erosion control, namely:

The Department of Water Affairs and Forestry, February 2005. Environmental Best Practice Specifications: Construction Integrated Environmental Management Sub-Series No. IEMS 1.6. Third Edition. Pretoria.

- Areas that will require storm water and erosion control measures will include, for example: disturbed water course areas where new water course crossings are established and upgrades have been undertaken, new access roads and underground cabling, permanent laydown areas, crane pads and any other remaining hard surfaces.

- As per the EMP, construction activity will be limited to specified areas. Stockpiles of aggregate and material will be positioned at least 50m away from drainage lines and wetlands.

The civil works contractor will compile a comprehensive Storm Water and Erosion Control Management Plan before construction is initiated, which will include the following items where necessary:

- Run-off control
- Slope attenuation
- Silt fences
- Storm water channels and catch pits
- Shade / catch nets
- Soil bindings
- Geofrabrics
- Hyrdroseeding and/or
- Mulching over cleared areas

Proposed mitigation measures to reduce storm water erosion

Surface water control measures

- Prevent the concentration or flow of surface water or storm water down cut or fill slopes or along pipeline routes or roads and ensure measures to prevent erosion are in place prior to construction.
- Storm water and any runoff generated by hard surfaces should be discharged into retention swales or areas with rock rip-rap. These areas should be grassed with indigenous vegetation. These energy dissipation structures should be placed in a manner that flows are managed prior to being discharged back into the natural water courses, thus not only preventing erosion, but also supporting the maintenance of natural base flows within these systems, i.e. hydrological regime (water quantity and quality) is maintained.
- Mitigate against siltation and sedimentation through the use of the above mentioned structures and ensure that all structures do not cause erosion.

- Ensure that all storm water control features have soft engineered areas that attenuate flows, allowing for water to percolate into the local aquifers.
- Minimise and restrict site clearing to areas required for construction purposes only and restrict disturbance to adjacent undisturbed natural vegetation. Vegetation clearing should occur in parallel with the construction progress to minimise erosion and/or run-off. Large tracts of bare soil will either cause dust pollution or quickly erode and then cause sedimentation in the lower portions of the catchment.
- Minimise the diversion of flows into different catchments.
- If implementing dust control measures, prevent over-wetting, saturation and run-off that may cause erosion and sedimentation.
- Water course (stream) crossings should not trap any run-off, thereby creating inundated areas, but allow for free flowing water courses.

Erosion control measures

- Areas susceptible to erosion must be protected by appropriate measures and repair of any damage caused by erosion due to construction activities must be undertaken as soon as possible.
- Minimise erosion and sedimentation into water courses through effective stabilisation (gabions and reno mattresses) and re-vegetation of disturbed river banks (Refer to rehabilitation specifications and erosion control measures below).

- Stabilisation of sandy, dispersive slopes or slopes steeper than 1:3 will be required. The following methods may be required:
  - Topsoil covered with a geotextile and a grass seed mixture (see Rehabilitation Specifications).
  - Logging or stepping following the contours of the slope.
  - Earth or rock-pack cut-off berms.
  - Packed branches.
  - Benches (sand bags).

- Stabilisation of near vertical slopes (1:1 – 1:2), if created during construction, will be required using hard structures that have a natural look. The following methods may be required:
  - Gabions (preferred method).
  - Retaining walls.
  - Stone pitching.

- The slopes of all stream diversions must be protected. The following methods may be used:
  - Reno mattresses (preferred method).
  - Coarse rock (undersize rip-rap).

- Sandbags.

- Where feasible use rubber dams as stream diversions when establishing water course crossings. Although (and considering that these are non perennial water courses) the recommendation is to construct water course crossings during dry periods (or no flow periods), if possible.

- Therefore, any concentration of natural water flow caused by road works or hardstands areas will be treated as follows:
  - if water flow is sub-critical nothing is required
  - if water flow is supercritical the outlets will be provided with protection (either gabions or stone pitching – depending on the flows) to release water subcritical back into the watercourse.

Engineering Specifications

A detailed Storm Water Management Plan describing and illustrating the proposed storm water control measures must be prepared by the Civil Engineers, indicating:

- Control measures to be implemented before and during the construction period, including the final storm water control measures (post construction).
- The location, area/extent (m^2/ha) and specifications of all temporary and permanent water management structures or stabilisation methods.
- The Resident Engineer will be responsible for ensuring implementation of the control measures on site during the construction period.

- The developer will be responsible for remedial action in the event that the approved storm water plan is not properly implemented and damage to the environment is caused.
- Concrete lined drains be placed adjacent to road to transfer the water to the existing water courses.

- At the point where storm water is discharged, energy dissipaters will be constructed so as slow the flow of the run-off.
- All cut and fill banks will be seeded with an approved seed mix (as per the rehabilitation specifications) to ensure bank stabilisation and the elimination of potential erosion.

2. REHABILITATION

As per the WULA Questionnaire:

The Final EIA and EMP reports prescribe the rehabilitation of disturbed areas although a Rehabilitation Plan with rehabilitation specifications are not provided.

Refer to the EIA report:

1. Undertake Site Rehabilitation. *Site rehabilitation will occur where vegetation is disturbed in watercourses (drainage lines).*
2. Project Decommissioning Phase. *Site rehabilitation will occur where vegetation has been disturbed in wetlands and watercourses (drainage lines).*

Also Refer to the Draft EMP The table provides the overall project activities which may in some way impact on the wetlands and watercourses (drainage lines).

The following also includes rehabilitation phase activities that will be relevant to

Rehabilitation Specifications

- Employ a Horticultural Landscape Contractor to fulfil the rehabilitation of disturbed areas post construction.
- A detailed Rehabilitation Plan describing and illustrating the proposed rehabilitation activities on site must be prepared by the Horticultural Landscape Contractor i.e. areas of top soiling, seeding and planting of trees and/or shrubs; species; fertilization; seed sowing rates; watering etc (i.e. bill of quantities).
- The following document should be consulted for further support with respect to information regarding rehabilitation, namely:

  The Department of Water Affairs and Forestry, February 2005. Environmental Best Practice Specifications: Construction Integrated Environmental Management Sub-Series No. IEMS 1.6. Third Edition. Pretoria.

- These specifications may be modified by the Horticultural Landscape Contractor on consideration of site conditions.

Post and during construction rehabilitation activities

- Proper stockpile management of topsoil will be required during the construction phase.
- Rehabilitation of disturbed areas will be implemented as these areas become available for rehabilitation.
- Disturbed areas will include, for example: construction camp site, areas where underground cabling has been layed/buried, roadsides of new access roads,

disturbed water course areas where new water course crossings are established and upgrades have been undertaken, disturbed areas where infrastructure (e.g. turbines) are established.

- Stockpiled topsoil must be spread over disturbed areas (150 – 200mm thick) just prior to planting/seeding.
- Rip and scarify along the contours of the newly spread topsoil prior to watering and seeding.
- Organic fertilizers or compost shall be used if site conditions require it and can be applied as part of hydroseeding applications.
- Seed must be sown into weed-free topsoil that has been stockpiled (i.e. original topsoil).
- Indigenous plants (e.g. grass species such as *Cynodon dactylon, Eragrostis curvula*) shall be used to rehabilitate disturbed areas.
- Applying the seed through hydromulching (hydroseeding) is advantageous (or organic mulching after seeding).
- Watering is essential and rehabilitation should ideally occur during the wet season. See below for 'Watering'.
- The re-growth of alien plant species (e.g. *Acacia mearnsii, Pinus, Eucalyptus* spp, *Cestrum laevigatum*, *Solanum mauritianum*) will need to be monitored and removed. Once the Horticultural Landscape Contractor has fulfilled the contract obligations, the removal of aliens will be the responsibility of the project proponent. The project proponent should implement a programme assisted by Working for Water to remove all the alien plants and assist with future rehabilitation of water courses.
- If necessary, restrict movement of livestock in newly rehabilitated areas, where possible, while taking into consideration drinking areas/paths.

Watering (if required should the initial efforts not succeed)

- Watering is essential and rehabilitation should ideally occur during the wet/rainy season. If this is not possible, an initial watering period (supplemental irrigation) will be required to ensure plant establishment (germination and established growth).
- Generous watering during the first two weeks, or until the seeds have germinated, will be necessary (unless adequate rainfall occurs) i.e. seed beds will need to be kept moist for germination to occur.
- For grass to establish (once germination has occurred), rainfall or irrigation is needed at regular intervals, ideally every few days and possibly every day if weather conditions require it.
- During dry periods, with no rainfall, 100 litres per m^2 (or 100mm of rain) over a month or more, may be necessary to establish plants capable of surviving dry weather (or otherwise specified by the Horticultural Landscape Contractor).

Seeding

Maintenance and duration

- Rehabilitation will occur during construction as areas for plant rehabilitation become available and post construction i.e. once construction is completed and the remaining disturbed areas become available for plant rehabilitation.
- The rehabilitation period post construction is estimated to be over a period of 6 months (minimum) to 12 months (maximum), or otherwise specified by the Horticultural Landscape Contractor, particularly if planting of trees and shrubs occurs.
- The rehabilitation phase (including post seeding maintenance) should be at least a minimum of 6 months (depending on time of seeding and rainfall) to ensure establishment of plants with a minimum achievement of 80 % cover (excluding alien plant species).
- If plant establishment is not achieved within the specified maintenance period, maintenance of these areas shall be continued until at least 80 % cover is achieved (excluding alien plant species).
- Additional seeding may be necessary to achieve 80 % cover.
- Any plant that dies during the maintenance period shall be replaced by the Horticultural Landscape Contractor, at the cost of the Horticultural Landscape Contractor.
- Succession of natural plant species should be encouraged.

3. MONITORING

- An Environmental Control Officer should be employed to oversee the implementation of the Construction Environmental Management Plan (CEMP), which will include the storm water management and rehabilitation specifications contained herewith.
- The CEMP should therefore include a monitoring and auditing programme, which defines roles and responsibilities etc.

The following protocols are recommended with regards to monitoring and should be included in the final CEMP:

- Weekly or monthly environmental auditing (as specified in the license).
- Monthly or quarterly environmental audit reports to be submitted to the Department of Water Affairs (DWA), or as advised by DWA.
- Immediate notification of transgression to the Site Manager (and Project Contractor/Engineer) and provision of suitable mitigation measures to rectify environmental damage.
- If transgressions continue, report such incidences to the DWA immediately, although such incidences must be recorded in the audit reports.
- Additional conditions will be specified in the water use license for the project.

Appendix E

Environmental Incidents

LOG Environmental Incident Log

ENVIRONMENTAL INCIDENT LOG				
Date	**Env. Condition**	**Comments** *(Include any possible explanations for current condition and possible responsible parties. Include photographs, records etc. if available)*	**Corrective Action Taken** (*Give details and attach documentation as far as possible)*	**Signature**

Complaints Record Sheet

Complaints Record Sheet

COMPLAINTS RECORD SHEET	**File Ref:** **Page …. of ….**	**DATE:** **…………………………**
COMPLAINT RAISED BY:		
CAPACITY OF COMPLAINANT:		
COMPLAINT RECORDED BY:		
COMPLAINT:		
PROPOSED REMEDIAL ACTION:		
ECO: ____________________ Date: ____________________		
NOTES BY ECO:		
ECO: ___________ Date: ___________ Site Manager: ___________ Date: ___________		

Appendix F

Management of Soils: Guidelines

Topsoil

- Source of topsoil
  - Topsoil shall be stripped from all areas that are to be utilised during the construction period and where permanent structures and access is required. These areas will include temporary and permanent access roads, construction camps, and lay down areas. Topsoil shall be stripped after clearing of woody vegetation and before excavation or construction commences.
  - The topsoil is regarded as the top 300mm of the soil profile irrespective of the fertility appearance, structure, agricultural potential, fertility and composition of the soil.

- Topsoil stripping
  - Soil shall be stripped to a minimum depth of 150mm and maximum depth of 300mm or to the depth of bedrock where soil is shallower than 300mm. Herbaceous vegetation, overlying grass and other fine organic matter shall not be removed from the stripped soil.
  - No topsoil which has been stripped shall be buried or in any other way be rendered unsuitable for further use by mixing with spoil or by compaction using machinery.
  - Topsoil shall preferably be stripped when it is in a dry condition in order to prevent compaction.

- Topsoil stockpiling
  - The Consulting Engineer or Environmental Control Officer shall stockpile stripped topsoil in areas, which have been approved. Soil stockpiles may take the form of windows.
  - To prevent erosion, material stockpiled for long periods (2 weeks) should be retained in a bermed area.
  - Topsoil, mulch and subsoil stockpiles must be placed in higher-lying areas of the sit, and must not be positioned within stormwater channels or areas of ponding.
  - Topsoil stripped from different soil zones shall be stockpiled separately and clearly identified as such. Under no circumstances shall topsoil obtained from different soil zones be mixed.
  - Soil stockpiles shall not be higher than 2m or stored for a period longer than one year. The slopes of soil stockpiles shall not be steeper than 1 vertical to 2.5 horizontal.

- No vehicles shall be allowed access onto the stockpiles after they have been placed. Topsoil stockpiles shall be clearly demarcated in order to prevent vehicle access and for later identification when required.
- Soil stockpiles must not become contaminated with oil, diesel, petrol, garbage or any other material, which may inhibit the later growth of vegetation in the soil.
- After topsoil removal has been completed, the Contractor shall apply soil conservation measures to the stockpiles where and as directed by the Consulting Engineer or Environmental Control Officer. This may include the use of erosion control fabric or grass seeding.

- Topsoil replacement
  - Topsoil shall be replaced to a minimum depth of 75mm over all areas where it has been stripped and over disused borrow pits, after construction in those areas has ceased. Topsoil placement shall follow as soon as construction in an area has ceased.
  - All areas onto which topsoil is to be spread shall be graded to the approximate original landform with maximum slopes of 1:25 and shall be ripped prior to topsoil placement. The entire area shall be ripped parallel to the contours to a minimum depth of 300mm.
  - Topsoil shall be placed in the same soil zone from which it had been stripped. However, if there is insufficient topsoil available from a particular soil zone to produce the minimum specified depth, topsoil may be brought from other soil zones at the approval of the Consulting Engineer or Environmental Control Officer.
  - Where topsoil that has been stripped by the Contractor is insufficient to provide the minimum specified depth, the Contractor shall obtain suitable substitute material from other sources at no cost to the employer. The suitability of the substitute material shall be determined by means of soil analyses, which are acceptable to the Consulting Engineer or Environmental Control Officer.
  - No vehicles shall be allowed access onto or through topsoil after it has been reinstated.
  - After topsoil reinstatement is complete, cleared and stockpiled vegetative matter shall be spread randomly by hand over the top soiled area. The vegetative material must be replaced on the areas from where it has been removed.

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