Report Number: 6428/108495

PROPOSED WIND AND SOLAR (PHOTOVOLTAIC) ENERGY FACILITIES ON KANGNAS FARM NEAR SPRINGBOK IN THE NORTHERN CAPE

LIFE-CYCLE ENVIRONMENTAL MANAGEMENT PROGRAMME

NOVEMBER 2012

DRAFT

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ABBREVIATIONS

CEMP	Construction Phase Environmental Management Programme
DEA	Department of Environmental Affairs
DEA&DP	Department of Environmental Affairs and Development Planning
DWA	Department of Water Affairs
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EIR	Environmental Impact Assessment Reports
EMP	Environmental Management Programme
LEMP	Life-Cycle Environmental Management Programme
NEMA	National Environmental Management Act (No. 107 of 1998)
OHS	Occupational Health and Safety Act (No. 85 of 1998)
OEMP	Operational Phase Environmental Management Programme
SDEMA	Specification Data Environmental Management
SPEC EMA	Specification Environmental Management

1 OVERVIEW

This document represents the Life-Cycle Environmental Management Programme (LEMP) for the proposed Wind and Solar (Photovoltaic) Energy Facilities on Kangnas Farm near Springbok in the Northern Cape.

1.1 Purpose of the LEMP

The LEMP has been included in the Environmental Impact Assessment Report (EIR) in order to provide a link between the impacts identified in the EIA Process and the actual environmental management on the ground during project implementation and operation. The purpose of this document is to provide for environmental management throughout the various life-cycle stages of the proposed development. The following stages are included:

- Planning and design,
- Pre-construction and construction,
- Operation, and
- Decommissioning.

Furthermore, this LEMP aims for alignment and optimisation of environmental management processes with conditions of authorisation that may arise, thereby ensuring that identified environmental considerations are efficiently and adequately taken into account during all stages of development.

1.2 Legal requirements of Environmental Management Programmes

In terms of the EIA Regulations (Regulation 543 of 18 June 2010) enacted in terms of the National Environmental Management Act (no. 107 of 1998) (NEMA), the proposed project triggers Activity 10, 11 and 18 of Regulation R544 (18 June 2010), Activity 1 and 7 of Regulation R545 (18 June 2010) as well as Activity 14 of Regulation R546 (18 June 2010). As the proposed project triggers listed activities in terms of Regulation R544, R545 and R546 it is necessary to submit an Environmental Impact Assessment Report (EIR) for Environmental Authorisation (EA) to the Department of Environmental Affairs (DEA). Section 22 (l) of the EIA Regulations require that a draft EMP is submitted as part of the EIR.

The contents of the EMP must meet the requirements outlined in Section 24N (2) and (3) of NEMA (as amended) and Section 33 of the EIA Regulations. The EMP must address the potential environmental impacts of the proposed activity on the environment throughout the project life-cycle including an assessment of the effectiveness of monitoring and management arrangements after implementation. The Department requires that the EMP be submitted together with the EIR so that it can be considered simultaneously. Table 1 lists the requirements of an EMP as stipulated by Section 33 of the EIA Regulations R543. Table 2 lists the requirements of an EMP as stipulated by Section 24N (2) and (3) of the NEMA (as amended).

Table 1: Section 33 of EIA Regulation R543 listing the requirements of an EMP

33. *A draft environmental management programme must comply with section 24N of the Act and include –*

(a) details of –
- *(i) the person who prepared the environmental management programme; and*
- *(ii) the expertise of that person to prepare an environmental management programme;*

(b) information on any proposed management or mitigation measures that will be taken to address the environmental impacts that have been identified in a report contemplated by these Regulations, including environmental impacts or objectives in respect of—
- *(i) planning and design;*
- *(ii) pre-construction and construction activities;*
- *(iii) operation or undertaking of the activity;*
- *(iv) rehabilitation of the environment; and*
- *(v) closure, where relevant.*

(c) a detailed description of the aspects of the activity that are covered by the draft environmental management programme;

(d) an identification of the persons who will be responsible for the implementation of the measures contemplated in paragraph (b);

(e) proposed mechanisms for monitoring compliance with and performance assessment against the environmental management programme and reporting thereon;

(f) as far as is reasonably practicable, measures to rehabilitate the environment affected by the undertaking of any listed activity or specified activity to its natural or predetermined state or to a land use which conforms to the generally accepted principle of sustainable development, including, where appropriate, concurrent or progressive rehabilitation measures;

(g) a description of the manner in which it intends to—
- *(i) modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation;*
- *(ii) remedy the cause of pollution or degradation and migration of pollutants;*
- *(iii) comply with any prescribed environmental management standards or practices;*
- *(iv) comply with any applicable provisions of the Act regarding closure, where applicable;*
- *(v) comply with any provisions of the Act regarding financial provisions for rehabilitation, where applicable;*

(h) time periods within which the measures contemplated in the environmental management programme must be implemented;

(i) the process for managing any environmental damage, pollution, pumping and treatment of extraneous water or ecological degradation as a result of undertaking a listed activity;

(j) an environmental awareness plan describing the manner in which—
- *(i) the applicant intends to inform his or her employees of any environmental risk which may result from their work; and*
- *(ii) risks must be dealt with in order to avoid pollution or the degradation of the environment;*

(k) where appropriate, closure plans, including closure objectives.

The legislation hereby aims to ensure that effective environmental management is implemented throughout the life cycle of the project via the translation of EIA management actions into the LEMP.

The Department of Environmental Affairs & Development Planning (DEA&DP)'s *Guideline for Environmental Management Plans* (2005) aims to inform and guide the preparation and implementation of EMPs. The guideline defines EMPs as:

> *"an environmental management tool used to ensure that undue or reasonably avoidable adverse impacts of the construction, operation and decommissioning*

of a project are prevented; and that the positive benefits of the project are enhanced".

The guideline further provides *"situations* [that] *could trigger the need for an EMP requiring authority approval"*. One such trigger is:

> *"EMPs covering specific activities assessed through an over-arching EIA and incorporated into a Strategic Environmental Management Plan. A tiered system of EIA leading to a* [Strategic EMP] *and multiple EMPs may apply to large-scale complex developments with several sub-projects. In this case, an over-arching EIA may serve as the basis for environmental approval for the overall development. This may be supported by a* [Strategic EMP] *that is approved by the authorities. However, one or more EMPs may be required for the specific activities that form part of the larger development".*

Table 2: Section 24N (2) and (3) of the NEMA (as amended) listing the requirements of an EMP

24N.(2)	*the environmental management programme must contain-*
(a)	*information on any proposed management, mitigation, protection or remedial measures that will be undertaken to address the environmental impacts that have been identified in a report contemplated in subsection 24(1A), including environmental impacts or objectives in respect of –*
	(i) planning and design;
	(ii) pre-construction and construction activities;
	(iii) the operation or undertaking of the activity in question;
	(vi) the rehabilitation of the environment; and
	(vii) closure, where relevant.
(b)	*details of –*
	(i) the person who prepared the environmental management programme; and
	(ii) the expertise of that person to prepare an environmental management programme
(c)	*a detailed description of the aspects of the activity that are covered by the draft environmental management plan;*
(d)	*information identifying the persons who will be responsible for the implementation of the measures contemplated in paragraph (a);*
(e)	*information in respect of the mechanisms proposed for monitoring compliance with the environmental management programme and for reporting on the compliance.*
(f)	*as far as is reasonable practicable, measures to rehabilitate the environment affected by the undertaking of any listed activity or specified activity to its natural or predetermined state or to a land use which conforms to the generally accepted principle of sustainable development; and*
(g)	*a description of the manner in which it intends to-*
	(i) modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation;
	(ii) remedy the cause of pollution or degradation and mitigation of pollutants; and
	(iii) comply with any prescribed environmental management standards or practices.
(3)	*the environmental management programme must , where appropriate-*
(a)	*set out time periods within which the measures contemplated in the environmental management programme must be implemented;*
(b)	*contain measures regulating responsibilities for any environmental damage, pollution, pumping and treatment of extraneous water or ecological degradation as a result of prospecting or mining operations or related mining activities which may occur inside and outside the boundaries of the prospecting area or mining area in question; and*
(c)	*develop an environmental awareness plan describing the manner in which-*
	(i) the applicant intends to inform his or her employees of any environmental risk which may result from their work; and

(ii) risks must be dealt with in order to avoid pollution or the degradation of the environment.

The LEMP aims to meet the EMP requirements as legislated by the NEMA Regulations (as amended) as well as falling in line with the DEA&DP guideline document for an Environmental Management Plan[1]. It should however be noted that no guideline or guidance exists in terms of best practice approach to LEMPs. This document should thus be seen in an iterative context allowing for amendments throughout the life-cycle of the project, allowing for adjustments as new information is made available.

1.3 Structure of the LEMP

As discussed above, the LEMP aims to address environmental management throughout the project life-cycle, from planning and design, through construction, to operation and potential decommissioning. The LEMP has been structured to include the following sections:

1. Discussion summarising environmental management influencing the planning and design of the proposed project (Chapter 2);
2. Construction EMP based on identified impacts and mitigation measures from the EIR (Chapter 3);
3. Operational Framework based on identified impacts and mitigation measures from the EIR (Chapter 4); and
4. Decommissioning Framework providing guidance on key considerations to be considered during decommissioning/closure (Chapter 5).

1.4 Expertise of Environmental Assessment Practitioners

Section 33 of EIA Regulations and Section 24N (2) and (3) of NEMA (as amended) requires that an EMP must include the details of the person(s) who prepared the EMP, and the expertise of that person to prepare an EMP. In this regard, the *Curriculum Vitae* of the Environmental Assessment Practitioners who compiled the LEMP are included in **Appendix A**.

[1] Lochner, P. 2005. *Guideline for Environmental Management Plans*. CSIR Report No ENV-S-C 2005-053 H. Republic of South Africa, Provincial Government of the Western Cape, Department of Environmental Affairs & Development Planning, Cape Town.

2 PLANNING AND DESIGN

This section has been divided into subsections which outline how environmental considerations have informed and been incorporated into the planning and design phases of the proposed wind energy facility. Detailed design is usually undertaken as part of the pre-construction phase as it is a costly undertaking which is generally only costed for once all required authorisations have been obtained. Thus, the planning and design phases discussed are limited to those associated with the pre-authorisation phases. Mitigation measures have been recommended for the detailed design phase.

2.1 Project Description

South Africa Mainstream Renewable Power Developments (Pty) Ltd (Mainstream) intends to develop a 560 MW wind energy facility and a 225 MW solar Photovoltaic (PV) and /or Concentrated Photovoltaic (CPV) energy facility on the farms near Springbok in the Northern Cape. Associate with the proposed wind energy facility would a substation, and the same for the proposed solar energy facility. Aurecon South Africa (Pty) Ltd (Aurecon) has been appointed to undertake the requisite environmental process as required in terms of the National Environmental Management Act (No. 107 of 1998), as amended, on behalf of Mainstream.

The proposed projects entail the generation of electricity from wind and solar resources. The construction period will entail approximately 12 - 18 months for the proposed wind energy facility and 24 months for the proposed solar photovoltaic energy facility. 180 wind turbines are proposed of 1.5-4 MW capacity. The proposed solar energy facility (225 MW of photovoltaic (PV) and/or Concentrated PV (CPV)) may include tracking systems and would have an approximate footprint of 793 hectares (ha). An onsite connection is proposed via an existing 220 kilovolt Eskom line. It is proposed to construct one main substation linking each of the proposed energy facilities and the Eskom line and two satellite substations in the proposed wind energy facility that would link sectors of the facility to the main substation with overhead lines.

The proposed project would take place on the farms Kangnas (Farm No. 77 Portion 3 and the Remainder), Koeris (Farm No. 78 Portion 1), Areb (Farm No. 75 Portion 0) and Smorgenschaduwe (Farm No. 127 Portion 0) in the Northern Cape (see **Figure 2.1**). These farms are located approximately 48 km east of Springbok and are accessed via the N14. The five farms cover an area of approximately 46 535 ha.

2.2 Summary of Alternatives

To summarise, the feasible alternatives assessed in the EIR include the following:

Proposed wind energy facility:

- Location alternatives:
    - One location for the proposed wind energy facility;
- Activity alternatives:
    - Wind energy generation via wind turbines; and
    - “No-go” alternative to wind energy production.

- Site layout alternatives:
    - One layout alternative per site;
    - One main substation location, with two satellite substations.
- Technology alternatives:
    - A minimum and maximum tip height of 100 – 180 m.

Proposed solar energy facility:

- Location alternatives:
    - One location for the proposed PV plant.
- Activity alternatives:
    - Solar energy generation via a PV plant; and
    - "No-go" alternative to solar energy production.
- Site layout alternatives:
    - One layout alternative (225 MW with 793 ha footprint).
- Technology alternatives:
    - Two technology alternatives in terms of the solar panel type (PV vs CPV); and
    - Mounting system: trackers vs fixed mount.

2.3 Design of the project

The design for the proposed development should respond to the identified environmental constraints and opportunities. The following mitigation measures related to the design for the proposed development have been recommended to reduce the environmental impacts.

General:
No structures to be occupied or frequented by people shall be built within delineated servitude areas.

Mitigation measures during the operation phase

Botanical
Proposed Wind Energy Facility

- Wherever possible, restrict construction activities to designated turbine sites and lay-down areas.
- Avoid Platbakkies Succulent Shrubland gravel patches.
- Micro-site turbines with the aid of a botanist, to avoid sensitive sites.
- Place underground cables in shallow trenches alongside the internal access roads to avoid additional impacts to those caused by roads.

Proposed Solar Energy Facility

- Avoid drainage lines and maintain a buffer of at least 30 m from drainage lines.
- Collect seeds from *Parkinsonia africana* (wild green hair trees) cultivated offsite. The cultivated shrubs could be planted on the site and effectively used for visual screening of the PV infrastructure where required while simultaneously keeping them as part of the vegetation on the site.

Avifauna

Proposed Wind and Solar Energy Facilities

- Carefully monitor the local avifauna pre- and post-construction for a one year (12 month) period with monitoring scheduled for 15-18 days in each of the four seasons. Implement appropriate additional mitigation as and when significant changes are recorded in the number, distribution or breeding behaviour of the priority species listed in the Avifaunal Impact Assessment, or when collision or electrocution mortalities are recorded.

- Minimize the disturbance associated with the operation of the facilities, schedule maintenance activities to avoid and/or reduce disturbance in sensitive areas at sensitive times. Keep disturbance from maintenance activities at a minimum where specific turbines fall within sensitive areas.

Bats

Proposed Wind Energy Facility

- Do not place turbines in the area indicated as having a High Bat Sensitivity (Figure 4.8**).** Give special attention to areas of Moderate Bat Sensitivity and prioritise these in post construction monitoring and implementation of mitigation measures;
- Undertake affordable long term monitoring of bats and the potential impacts of turbines on them to effectively fine tune mitigation.
- Carry out post-construction monitoring of possible bat fatalities at least four seasons at the proposed wind energy facility, focus on turbines in the Moderate bat sensitivity areas and at the two small caves on site. Pre-construction monitoring is optional for this site.
- Consider implementing an ultrasonic deterrent device to repel bats from wind turbines should any turbines be placed in moderate sensitivity areas. If this measure proves effective it may be implemented in place of curtailment upon agreement with a bat specialist, based on long term monitoring; and
- Share research from long term monitoring with academic institutions to aid in research of the potential impacts of wind energy facilities on bats.
- Where recommended by long-term bat monitoring, curtail[2] selected turbines to lessen bat mortalities. Curtailment should be informed by long term bat monitoring.

Proposed Solar Energy Facility

- *No mitigation is recommended*.

Impacts on local and regional economy (employment)

Proposed Wind and Solar Energy Facilities

- Source local labour, businesses and resources for supply, where possible.
- Compile relevant and clearly defined procurement standards to govern choices of suppliers, products and procedures for communication with suppliers. Maintain well defined standards as analysed by the developer, for quality and sustainability purposes, as well as for monitoring and evaluation of the suppliers and service providers.

Impacts on social environment

[2] Curtailment is where the turbine cut-in speed is raised to a higher wind speed based on the principle that bats will be less active in strong winds due to the fact that their insect food cannot fly in strong wind speeds, and the small insectivorous bat species need to use more energy to fly in strong winds.

Proposed Wind and Solar Energy Facilities

- Establish an educational notice board as an ideal practical learning environment for local and district schools.
- Source supplies from local labour, businesses and resources, where possible.
- Encourage the local government and stakeholders to undertake studies to ascertain the feasibility of establishing manufacturing activities in the area related to the proposed activities and if green energy industry is feasible.

Impacts on agricultural land

Proposed Wind Energy Facility

- Avoid homesteads and interact with land owners with regards to the final turbine positioning.

Proposed Solar Energy Facility

- Allow periodic grazing of sheep within the PV site to minimise loss of grazing land.

Impacts on noise

Proposed Wind Energy Facility

- Educate surrounding receptors on the sound generated by the wind energy facility; maintain essential public relations and community involvement throughout the lifespan of the proposed facility.
- Provide a contact number of the developer in the case of sudden and sharp increases in sound levels result from mechanical malfunctions or perforations or slits in the blades.

Proposed Solar Energy Facility

- No mitigation is recommended

Heritage and Palaeontology

Proposed Wind and Solar Energy Facilities

- *No mitigation is recommended*

Visual

Proposed Wind and Solar Energy Facilities

- Use LED lighting.
- Keep lighting to an efficient minimum while still keeping within the safety norms. (see Annexure 3).
- Rehabilitate previously modified areas continually.
- No branding on the turbines.
- No lights on the blade tips (within safety limits).

Freshwater

Proposed Wind and Solar Energy Facilities

- Limit operational activities as far as possible to the delineated site and the identified access routes.
- Continuously monitor invasive alien plant growth to promptly detect re-establishment.
- Locate any septic tanks at least 100 m (measured from top of bank) from the ephemeral streams and at least 1 000 m away from the springs or any boreholes/well points.

- Compile a storm water management plan and maintain storm water run-off infrastructure on site.
- Stabilise any erosion areas effectively as they develop.
- Direct the storm water management plan to addressing runoff discharge into watercourses flowing across the site.

Mitigation measures during the construction phase

Botanical impacts
Proposed Wind Energy Facility

- Where possible, restrict construction activities to designated turbine sites and lay-down areas.
- Avoid Platbakkies Succulent Shrubland gravel patches.

Proposed Solar Energy Facility

- Collect seeds from *Parkinsonia africana* (wild green hair trees) and cultivate off site. The cultivated shrubs could be planted on the site and effectively used for visual screening of the solar PV infrastructure where required while simultaneously keeping them as part of the vegetation on the site.

Avifauna impacts
Proposed Wind and Solar Energy Facilities

- Restrict the construction footprint to a bare minimum.
- Demarcate 'No-go' areas identified during pre-construction, to minimise disturbance associated with construction of the facility.
- Reduce and maintain minimum noise when blasting on the ridge-top for wind turbines foundations. No blasting during breeding seasons (mostly spring: avifaunal monitoring programme to recommend) of resident avifaunal community and priority species. Synchronise with neighbouring blasts where possible.
- Exclude development or disturbance from sensitive areas, including the Secretary bird nest site and the two wetland sites (the 'Granite Pan' and Steenbok Pan), currently outside or on the edge of the footprint area for the wind energy facility but will be impacted during the construction phase.
- Minimise the length of all new power lines installed, ensure that all lines have flight diverters, are adequately insulted and bird friendly when configured.
- Burry transmission lines connecting each turbine to the installation to avoid avian collision posed by overhead lines.
- Re-schedule construction or maintenance activities for turbines positioned in areas subsequently identified as particularly important for disturbance and/or displacement of sensitive, priority bird species.
- Consider marking the turbine blades to reduce collisions.
- Adopt an exclusion zone of at least 1 km for Verreaux`s eagle.

Bats impacts
Proposed Wind and Solar Energy Facilities

- Avoid placing associated infrastructure (substation, gridline, roads) in areas with a High Bat Sensitivity. No underground cabling should be laid in such areas, if so; carry out vegetation rehabilitation to rectify the impact

Sedimentation and erosion impacts
Proposed Wind and Solar Energy Facilities

- Place wind turbines away from identified drainage channels.
- Confine construction activities to identified wind energy facility site and access routes.
- Limit disturbance of drainage channels when constructing transmission lines and rehabilitate accordingly upon completion of construction.
- Utilise existing road infrastructure to minimize the overall disturbance and if access routes are to be constructed through ephemeral streams, maintain minimum disturbance.
- Maintain stream flow at all crossings over drainage channels or stream beds.
- Coincide/ harmonise road infrastructure and power transmission lines to minimize the impact.
- Rehabilitate disturbed areas to avoid erosion or invasive alien plant growth.
- Rehabilitate all crossings over drainage channels or stream beds after the construction phase to maintain flow.
- Maintain a buffer of 30 m (measured from top of bank) adjacent to the identified ephemeral streams and 500m from the springs.
- Properly store and contain all materials on the construction sites. Manage waste disposal properly. Provide regularly serviced ablution facilities at least 100 m away from any drainage areas/ephemeral streams and within terms of the EMP for the construction phase.
- Construct all septic tanks at least 100 m (measured from top of bank) from the ephemeral streams and at least 1 000 m away from the springs or any boreholes/well-points.
- Maintain storm water run-off infrastructure to mitigate water flow and quality impacts of storm water leaving the energy facilities site. Stabilise all erosion features effectively.

Heritage resources impacts
Proposed Wind Energy Facility

- Consider 'Orange Hill' with its surrounds a no-go area and a buffer as shown in **Figure 4.32**. The buffer is approximately 700 m diameter.
- Consider 'SMS Hill' with its surrounds a no-go area and a buffer as shown in **Figure 4.33**. The buffer is approximately east/west and 1.9 km north/south (approximately 450 m from all recorded heritage sources).
- Consider 'Gobees se Pan' with its immediate surroundings a no-go area and a buffer as shown in (**Figure 4.34)** The buffer is approximately 1.2 km east/west and 1.3 km north/south (approximately 350 m from all recorded heritage sources).
- Consider 'Springbokvlei' with its immediate surroundings a no-go area and a buffer as shown in **Figure 4.35**. The buffer is approximately 9 00 m east/west and 1 000 m north/south (approximately 200 m from all recorded heritage sources).

Proposed Solar Energy Facility

- *No mitigation is recommended*

Impacts on Palaentology
Proposed Wind Energy Facility

- Notify the responsible Environmental Control Officer "ECO" of the known fossil sites and discovery of fossil remains on site during construction.

- Safeguard (preferably *in situ*) all fossil remains (e.g. vertebrate bones and teeth, large blocks of petrified wood, fossil plant-rich horizons, buried laminated shales) discovered during construction, ECO to alert the South African Heritage Resource Agency (SAHRA) for further action by a permitted professional palaeontologist (e.g. recording, sampling or collection). Curate all fossil material in an approved repository (e.g. museum or university collection) and all fieldwork and reports should meet the minimum standards developed by SAHRA.

Proposed Solar Energy Facility

Visual impacts

Proposed Wind and Solar Energy Facilities

- Implement dust control measures.
- Strictly control all litter.
- Stockpile all topsoil (if any) in a suitable location and re-utilise it for landscaping / rehabilitation.
- Dispose excess material from earthworks offsite or through natural landscaping of areas. No dumping or piling.
- Use grey chain link fence or similar (not exceeding N14) to blend with the agricultural landscape context.
- Rehabilitate the foundation area upon completion of construction phase.
- Constrain all signage (if any).

Impacts on socio-economic environment

Proposed Wind and Solar Energy Facilities

- Source supplies of services, labour and products from the local and regional economies during construction stage.
- Implement labour contracts whereby Contractors are required to employ a certain percentage of local labour;
- Encourage the local authority to implement a services management plan to monitor demand on infrastructure services so that upgrades or new services can be installed in a timeous manner; and
- Provide basic construction skills programs pertaining to the projects in order to maximise the benefits of the project in the local municipality and to leave a lasting influence on the workforce.
- Implement an educational initiative during the construction phases to avail an ideal practical learning environment for local and district schools.

Impacts on Agriculture

Proposed Wind and Solar Energy Facilities

- Minimise clearing activities (panel/turbine and road footprint).
- Withhold activities in the event of heavy rains to reduce the risk of erosion.
- Undertake storm water control and wind screening where earth works are required, prevent soil loss.
- Armour any steep or large embankments that are expected to be exposed during the 'rainy' months. Use a fascine structure consisting of a natural wood material to strengthen earthen structures or embankments.

Transportation impacts

Proposed Wind and Solar Energy Facilities

- Maintain good sightlines on road junctions;
- Implement traffic control measures where necessary;
- Transport components overnight as far as possible; and
- Engage with the roads authorities prior to construction to ensure the necessary road upgrades, permits, traffic escorts etc are scheduled.

Noise impacts

Proposed Wind Energy Facility

- Ensure equivalent A-weighted daytime noise levels below 45 dBA at potentially sensitive receptors (see Error! Reference source not found. for sensitive receptors);
- Ensure that maximum noise levels at potentially sensitive receptors be less than 65 dBA;
- Prevent the generation of disturbing or nuisance noises for example a transformer must be placed more than 200 m away from any house
- Ensure acceptable noise levels (within SANS guidelines) at surrounding stakeholders and potentially sensitive receptors;
- Ensuring compliance with the Noise Control Regulations;
- Ensure a good working relationship between the developer and all potentially sensitive receptors. Establish communication channels and notify the sensitive receptor if work is to take place close to them (within 500 m). provide information to the potential sensitive receptor(s), at least 2 days before the work takes place, include:
    - Proposed working times;
    - Timespan that the activity is anticipated to last
    - The specific activity and the need there of;
    - Contact details for lodging complains and other issues of concern
- Ensure that equipment is well-maintained and fitted with correct and appropriate noise abatement measures.
- Conduct noise monitoring for complains received and provide feedback on measured levels.
- Ensure that the construction crew abides to the local by-laws regarding noise; and if possible undertake construction work during normal working hours (06h00 – 22h00; adopted from SANS 10103:2008), from Monday to Saturday; with extension upon agreement (in writing) with all surrounding (within a 1 km) potentially sensitive receptors.

Proposed Solar Energy Facility

- *No mitigation is recommended*.

Storage of hazardous substances on site

Proposed Wind Energy Facility

- Implement measures as provided in the EMP, which *inter alia* specify storage details of hazardous compounds and emergency procedures in the event of a spillage; and
- Comply with the various pieces of legislation controlling the use of hazardous substances at a construction site.

Proposed Solar Energy Facility

- *No mitigation is recommended*.

Dust impacts

Proposed Wind Energy Facility

- Implement measures as provided in the EMP, including procedures dealing with dust pollution events including watering of roads, etc.

No mitigation is recommended for the proposed Solar Energy Facility

Mitigations for Wind and Solar energy substations and grid connections during construction phases:

Botanical impacts
Proposed Wind Energy Facility

- Where possible, restrict construction activities to designated turbine sites and lay-down areas.
- Avoid Platbakkies Succulent Shrubland gravel patches.

Proposed Solar Energy Facility

- Collect seeds from *Parkinsonia africana* (wild green hair trees) and cultivate off site. The cultivated shrubs could be planted on the site and effectively used for visual screening of the solar PV infrastructure where required while simultaneously keeping them as part of the vegetation on the site.

Avifauna impacts
Proposed Wind and Solar Energy Facilities

- Restrict the construction footprint to a bare minimum.
- Demarcate 'No-go' areas identified during pre-construction, to minimise disturbance associated with construction of the facility.
- Reduce and maintain minimum noise when blasting on the ridge-top for wind turbines foundations. No blasting during breeding seasons (mostly spring: avifaunal monitoring programme to recommend) of resident avifaunal community and priority species. Synchronise with neighbouring blasts where possible.
- Exclude development or disturbance from sensitive areas, including the Secretary bird nest site and the two wetland sites (the 'Granite Pan' and Steenbok Pan), currently outside or on the edge of the footprint area for the wind energy facility but will be impacted during the construction phase.
- Minimising the length of all new power lines installed, ensure that all lines have flight diverters, are adequately insulted and bird friendly when configured.
- Burry transmission lines connecting each turbine to the installation to avoid avian collision posed by overhead lines.
- Re-schedule construction or maintenance activities for turbines positioned in areas subsequently identified as particularly important for disturbance and/or displacement of sensitive, priority bird species.
- Consider marking the turbine blades to reduce collisions.
- Adopt an exclusion zone of at least 1 km for Verreaux`s eagle.

Bats impacts
Proposed Wind and Solar Energy Facilities

- Avoid placing associated infrastructure (substation, gridline, roads) in areas with a High Bat Sensitivity. No underground cabling should be laid in such areas, if so; carry out vegetation rehabilitation to rectify the impact

Sedimentation and erosion impacts
Proposed Wind and Solar Energy Facilities

- Place wind turbines away from identified drainage channels.
- Confine construction activities to identified wind energy facility site and access routes.

- Limit disturbance of drainage channels when constructing transmission lines and rehabilitate accordingly upon completion of construction.
- Utilise existing road infrastructure to minimize the overall disturbance and if access routes are to be constructed through ephemeral streams, maintain minimum disturbance.
- Maintain stream flow at all crossings over drainage channels or stream beds.
- Coincide/ harmonise road infrastructure and power transmission lines to minimize the impact.
- Rehabilitate disturbed areas to avoid erosion or invasive alien plant growth.
- Rehabilitate all crossings over drainage channels or stream beds after the construction phase to maintain flow.
- Maintain a buffer of 30 m (measured from top of bank) adjacent to the identified ephemeral streams and 500m from the springs.
- Properly store and contain all materials on the construction sites. Manage waste disposal properly. Provide regularly serviced ablution facilities at least 100 m away from any drainage areas/ephemeral streams and within terms of the EMP for the construction phase.
- Construct all septic tanks at least 100 m (measured from top of bank) from the ephemeral streams and at least 1 000 m away from the springs or any boreholes/well-points.
- Maintain storm water run-off infrastructure to mitigate water flow and quality impacts of storm water leaving the energy facilities site. Stabilise all erosion features effectively.

Heritage resources impacts
Proposed Wind Energy Facility

- Consider 'Orange Hill' with its surrounds a no-go area and a buffer as shown in **Figure 4.32**. The buffer is approximately 700 m diameter.
- Consider 'SMS Hill' with its surrounds a no-go area and a buffer as shown in **Figure 4.33**. The buffer is approximately east/west and 1.9 km north/south (approximately 450 m from all recorded heritage sources).
- Consider 'Gobees se Pan' with its immediate surroundings a no-go area and a buffer as shown in **Figure 4.34.** The buffer is approximately 1.2 km east/west and 1.3 km north/south (approximately 350 m from all recorded heritage sources).
- Consider 'Springbokvlei' with its immediate surroundings a no-go area and a buffer as shown in **Figure 4.35**. The buffer is approximately 9 00 m east/west and 1 000 m north/south (approximately 200 m from all recorded heritage sources).

No mitigation is recommended for the proposed Solar Energy Facility

Impacts on Palaentology
Proposed Wind Energy Facility

- Notify the responsible Environmental Control Officer "ECO" of the known fossil sites and discovery of fossil remains on site during construction.

- Safeguard (preferably *in situ*) all fossil remains (e.g. vertebrate bones and teeth, large blocks of petrified wood, fossil plant-rich horizons, buried laminated shales) discovered during construction, ECO to alert the South African Heritage Resource Agency (SAHRA) for further action by a permitted professional palaeontologist (e.g. recording, sampling or

collection). Curate all fossil material in an approved repository (e.g. museum or university collection) and all fieldwork and reports should meet the minimum standards developed by SAHRA.

No mitigation is recommended for the proposed Solar Energy Facility

Visual impacts

Proposed Wind and Solar Energy Facilities

- Implement dust control measures.
- Strictly control all litter.
- Stockpile all topsoil (if any) in a suitable location and re-utilise it for landscaping / rehabilitation.
- Dispose excess material from earthworks offsite or through natural landscaping of areas. No dumping or piling.
- Use grey chain link fence or similar (not exceeding N14) to blend with the agricultural landscape context.
- Rehabilitate the foundation area upon completion of construction phase.
- Constrain all signage (if any).

Impacts on socio-economic environment

Proposed Wind and Solar Energy Facilities

- Source supplies of services, labour and products from the local and regional economies during construction stage.
- Implement labour contracts whereby Contractors are required to employ a certain percentage of local labour;
- Encourage the local authority to implement a services management plan to monitor demand on infrastructure services so that upgrades or new services can be installed in a timeous manner; and
- Provide basic construction skills programs pertaining to the projects in order to maximise the benefits of the project in the local municipality and to leave a lasting influence on the workforce.
- Implement an educational initiative during the construction phases to avail an ideal practical learning environment for local and district schools.

Impacts on Agriculture

Proposed Wind and Solar Energy Facilities

- Minimise clearing activities (panel/turbine and road footprint).
- Withhold activities in the event of heavy rains to reduce the risk of erosion.
- Undertake storm water control and wind screening where earth works are required, prevent soil loss.
- Armour any steep or large embankments that are expected to be exposed during the 'rainy' months. Use a fascine structure consisting of a natural wood material to strengthen earthen structures or embankments.

Transportation impacts

Proposed Wind and Solar Energy Facilities

- Maintain good sightlines on road junctions;
- Implement traffic control measures where necessary;

- Transport components overnight as far as possible; and
- Engage with the roads authorities prior to construction to ensure the necessary road upgrades, permits, traffic escorts etc are scheduled.

Noise impacts

- Ensure equivalent A-weighted daytime noise levels below 45 dBA at potentially sensitive receptors (see Error! Reference source not found. for sensitive receptors);
- Ensure that maximum noise levels at potentially sensitive receptors be less than 65 dBA;
- Prevent the generation of disturbing or nuisance noises for example a transformer must be placed more than 200 m away from any house
- Ensure acceptable noise levels (within SANS guidelines) at surrounding stakeholders and potentially sensitive receptors;
- Ensuring compliance with the Noise Control Regulations;
- Ensure a good working relationship between the developer and all potentially sensitive receptors. Establish communication channels and notify the sensitive receptor if work is to take place close to them (within 500 m). provide information to the potential sensitive receptor(s), at least 2 days before the work takes place, include:
    - Proposed working times;
    - Timespan that the activity is anticipated to last
    - The specific activity and the need there of;
    - Contact details for lodging complains and other issues of concern
- Ensure that equipment is well-maintained and fitted with correct and appropriate noise abatement measures.
- Conduct noise monitoring for complains received and provide feedback on measured levels.
- Ensure that the construction crew abides to the local by-laws regarding noise; and if possible undertake construction work during normal working hours (06h00 – 22h00; adopted from SANS 10103:2008), from Monday to Saturday; with extension upon agreement (in writing) with all surrounding (within a 1 km) potentially sensitive receptors.

No mitigation is recommended for the proposed Solar Energy Facility

Storage of hazardous substances on site
Proposed Wind Energy Facility

- Implement measures as provided in the EMP, which *inter alia* specify storage details of hazardous compounds and emergency procedures in the event of a spillage; and
- Comply with the various pieces of legislation controlling the use of hazardous substances at a construction site.

No mitigation is recommended for the proposed Solar Energy Facility

Dust impacts
Proposed Wind Energy Facility

- Implement measures as provided in the EMP, including procedures dealing with dust pollution events including watering of roads, etc.

No mitigation is recommended for the proposed Solar Energy Facility

Mitigation measures for the Wind and Solar energy substations and grid connections during the operational phases:

Botanical impacts

Proposed Wind Energy Facility

- Wherever possible, restrict construction activities to designated turbine sites and lay-down areas.
- Avoid Platbakkies Succulent Shrubland gravel patches.
- Micro-site turbines with the aid of a botanist, to avoid sensitive sites.
- Place underground cables in shallow trenches alongside the internal access roads to avoid additional impacts to those caused by roads.

Proposed Solar Energy Facility

- Avoid drainage lines and maintain a buffer of at least 30 m from drainage lines.
- Collect seeds from *Parkinsonia africana* (wild green hair trees) cultivated offsite. The cultivated shrubs could be planted on the site and effectively used for visual screening of the PV infrastructure where required while simultaneously keeping them as part of the vegetation on the site.

Avifaunal (bird) impacts

Proposed Wind and Solar Energy Facilities

- Carefully monitor the local avifauna pre- and post-construction for a one year (12 month) period with monitoring scheduled for 15-18 days in each of the four seasons. Implement appropriate additional mitigation as and when significant changes are recorded in the number, distribution or breeding behaviour of the priority species listed in the Avifaunal Impact Assessment, or when collision or electrocution mortalities are recorded.

- Minimize the disturbance associated with the operation of the facilities, schedule maintenance activities to avoid and/or reduce disturbance in sensitive areas at sensitive times. Keep disturbance from maintenance activities at a minimum where specific turbines fall within sensitive areas.

Bat impacts

Proposed Wind Energy Facility

- Do not place turbines in the area indicated as having a High Bat Sensitivity (**Figure 4.9).** Give special attention to areas of Moderate Bat Sensitivity and prioritise these in post construction monitoring and implementation of mitigation measures;
- Undertake affordable long term monitoring of bats and the potential impacts of turbines on them to effectively fine tune mitigation.
- Carry out post-construction monitoring of possible bat fatalities at least four seasons at the proposed wind energy facility, focus on turbines in the Moderate bat sensitivity areas and at the two small caves on site. Pre-construction monitoring is optional for this site.
- Consider implementing an ultrasonic deterrent device to repel bats from wind turbines should any turbines be placed in moderate sensitivity areas. If this measure proves effective it may be implemented in place of curtailment upon agreement with a bat specialist, based on long term monitoring; and
- Share research from long term monitoring with academic institutions to aid in research of the potential impacts of wind energy facilities on bats.

- Where recommended by long-term bat monitoring, curtail[3] selected turbines to lessen bat mortalities. Curtailment should be informed by long term bat monitoring.

No mitigation is recommended for the proposed Solar Energy Facility

Heritage resources impacts (including palaeontology)

- *No mitigation is recommended*

Visual impacts

Proposed Wind Energy Facility

- Use LED lighting.
- Keep lighting to an efficient minimum while still keeping within the safety norms. (see **Annexure 3 of the VIA**).
- Continuously rehabilitate previously modified areas.
- No branding on the turbines.
- No lights on the blade tips (within safety limits).

Proposed Solar Energy Facility

- Use LED directional lighting without overhead lighting.
- Maintain lighting to an efficient minimum while still keeping within the safety norms (see Annexure 3).
- Rehabilitate previously modified areas continually.

Impacts on local and regional economy (employment)

Proposed Wind and Solar Energy Facilities

- Source local labour, businesses and resources for supply, where possible.
- Compile relevant and clearly defined procurement standards to govern choices of suppliers, products and procedures for communication with suppliers. Maintain well defined standards as analysed by the developer, for quality and sustainability purposes, as well as for monitoring and evaluation of the suppliers and service providers.

Impacts on social environment

Proposed Wind and Solar Energy Facilities

- Establish an educational notice board as an ideal practical learning environment for local and district schools.
- Source supplies from local labour, businesses and resources, where possible.
- Encourage the local government and stakeholders to undertake studies to ascertain the feasibility of establishing manufacturing activities in the area related to the proposed activities and if green energy industry is feasible.

Impacts on agricultural land

Proposed Wind Energy Facility

- Avoid homesteads and interact with land owners with regards to the final turbine positioning.

Proposed Solar Energy Facility

[3] Curtailment is where the turbine cut-in speed is raised to a higher wind speed based on the principle that bats will be less active in strong winds due to the fact that their insect food cannot fly in strong wind speeds, and the small insectivorous bat species need to use more energy to fly in strong winds.

- Allow periodic grazing of sheep within the PV site to minimise loss of grazing land.

Impacts on noise
Proposed Wind Energy Facility

- Educate surrounding receptors on the sound generated by the wind energy facility; maintain essential public relations and community involvement throughout the lifespan of the proposed facility.
- Provide a contact number of the developer in the case of sudden and sharp increases in sound levels result from mechanical malfunctions or perforations or slits in the blades.

No mitigation is recommended for the proposed Solar Energy Facility

Impacts on freshwater
Proposed Wind Energy Facility

- Limit operational activities as far as possible to the delineated site and the identified access routes.
- Continuously monitor invasive alien plant growth to promptly detect re-establishment.
- Locate any septic tanks at least 100 m (measured from top of bank) from the ephemeral streams and at least 1 000 m away from the springs or any boreholes/well points.
- Compile a storm water management plan and maintain storm water run-off infrastructure on site.
- Stabilise any erosion areas effectively as they develop.

Proposed Solar Energy Facility

- Direct the storm water management plan to addressing runoff discharge into watercourses flowing across the site.

To be included in Final EIR

Figure 2.1 Map indicating environmental sensitivity areas, buffers for the proposed site.

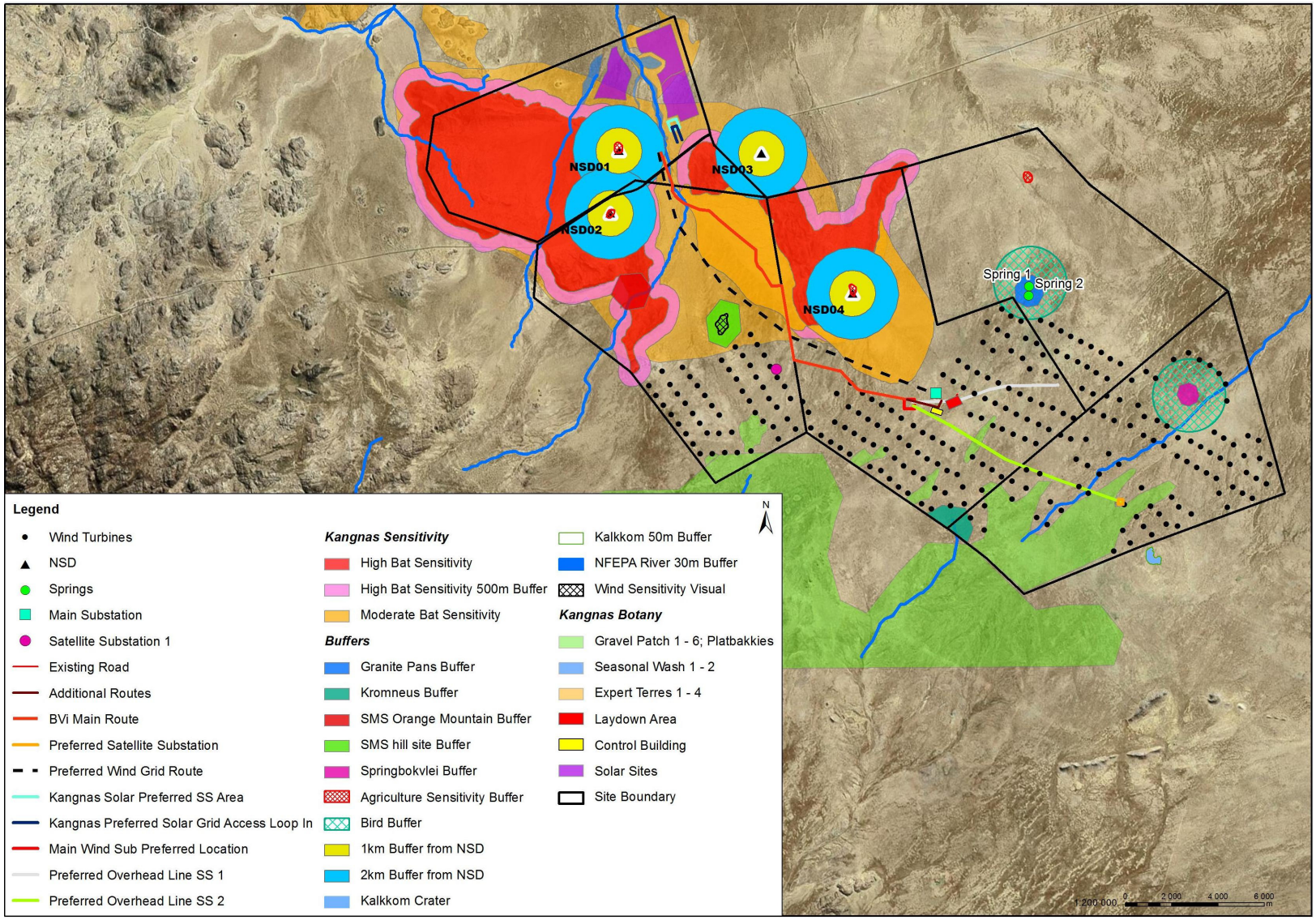

Figure 2.2 Map indicating environmental sensitivity areas, buffers and the proposed layout.

3 COMPLIANCE MONITORING

Prior to the commencement of construction and operation of the project a suitably qualified and experienced Environmental Control Officer (ECO) shall be appointed by the proponent to ensure that the mitigation rehabilitation measures and recommendations referred to in the EA are implemented and to ensure compliance with the provisions of the LEMP, thereby ensuring that identified environmental considerations are efficiently and adequately taken into account during all stages of development.

3.1 Roles and responsibilities

Client

Mainstream shall:

- Assume overall responsibility for the administration and implementation of the LEMP through an identified Project Manager or Engineer;
- Appoint or engage a suitably qualified Project Manager or Engineer; and
- Appoint or engage a suitably qualified independent ECO to monitor compliance with the LEMP and undertake monthly and close out audits of compliance with the requirements of the LEMP and provide a copy of the audit reports to DEA and the Contractor.

Project Manager

The Project Manager or Engineer shall:

- Have overall responsibility for the environment;
- Have the authority to stop works and issue fines, as necessary;
- Receive reports from the ECO and shall report to Mainstream; and
- Support the ECO in his/her roles and responsibilities.

ECO

The role of the ECO will be to oversee and monitor compliance with and implementation of the construction phase EMP and Operational Phase EMP, which includes compliance with the relevant conditions contained in the EA. This includes the following responsibilities:

i) Liaison with the Client, Project Manager or Engineer and DEA;
ii) Monitoring of all of the Contractor's activities for compliance with the various environmental requirements contained in the construction Specification;
iii) Monitoring of compliance with the EA related to the construction phase as issued by DEA as well as other relevant environmental legislation;
iv) Reviewing of the Contractor's environmental Method Statements;
v) Ensuring that the requisite remedial action is implemented in the event of non-compliance;
vi) Ensuring the proactive and effective implementation and management of environmental protection measures;
vii) Ensuring that a register of public complaints is maintained by the Contractor and that any and all public comments or issues are appropriately reported and addressed;
viii) Routine recording and reporting of environmental activities on a weekly and monthly basis;
ix) Recording and reporting of environmental incidents.

The duties of the ECO during operation phase will include:

i) Liaison with the Client and DEA;
ii) Monitoring of the operation of the project for compliance with the various environmental requirements contained in the Framework Operational EMP;
iii) Ensuring the proactive and effective implementation and management of environmental protection measures; and
iv) Monitoring of compliance with the EA related to the operational phase as issued by DEA as well as other relevant environmental legislation.

4 CONSTRUCTION PHASE EMP

The Construction EMP aims to address mitigation measures pertaining to the construction phase as identified during the course of the EIA. This section includes both General Specifications as well as Draft Specification Data, addressing general construction issues and issues that are not addressed by the General Specifications, respectively. It should be noted that the Draft Specification Data should be revised as required post authorisation to ensure that all relevant conditions of the EA have been addressed.

The complete General Specifications have been included in **Appendix B** and include the following sections:

- Scope
- Normative References
  - Supporting Specifications
- Definitions
- Requirements
  - Material
  - Material handling, use and storage
  - Hazardous substances
  - Shutter oil and curing compound
  - Bitumen
  - Plant
  - Ablution facilities
  - Solid waste management
  - Contaminated water
  - Site structures
  - Noise control
  - Lights
  - Fuel (petrol and diesel) and oil
  - Workshop, equipment maintenance and storage
  - Dust
  - Methods and procedures
  - Environmental awareness training
  - Construction personnel information posters
  - Site clearance
  - Site division
  - Site demarcation
  - "No go" areas
  - Protection of natural features
  - Protection of flora and fauna
  - Protection of archaeological and paleontological remains
  - Access routes/ haul roads
  - Cement and concrete batching
  - Earthworks
  - Pumping
  - Bitumen
  - Fire control
  - Emergency procedures
  - Community relations
  - Erosion and sedimentation control
  - Aesthetics
  - Recreation
  - Access to site
  - Crane operations
  - Trenching
  - Demolition
  - Drilling and jack hammering
  - Stockpiling
  - Site closure and rehabilitation
  - Temporary re-vegetation of the areas disturbed by construction
  - Temporary site closure
- Compliance with requirements and penalties
  - Compliance
  - Penalties
  - Removal from site and suspension of Works
- Measurement and Payment
  - Basic principles
    - General
    - All requirements of the environmental management specification
    - Work "required by the Specification Data"
  - Billed items
    - Method Statements: Additional work
    - All requirements of the environmental management specification

The following section provides the Draft Specification Data which, along with the General Specifications, will be included in all contract documentation associated with the proposed projects and will accordingly be binding on the Contractor.

4.1 Project Specifications

SDEMA ENVIRONMENTAL MANAGEMENT (SPEC EMA)

SCOPE: The general principles contained within this Specification Data: Environmental Management (SDEMA) shall apply to all construction related activities. All construction activities shall observe any relevant environmental legislation and in so doing shall be undertaken in such a manner as to minimise impacts on the natural and social environment.

SDEMA2 INTERPRETATIONS
SDEMA2.1 Application

This Specification contains clauses specifically applicable and related to the environmental requirements for the proposed Wind and Solar (Photovoltaic) Energy Facilities on Kangnas Farm near Springbok in the Northern Cape.

Where any discrepancy or difference occurs between this SDEMA and the Specification: Environmental Management (Comprehensive), the provision of this Specification shall prevail.

Definitions (Subclause 3)

For the purposes of this Specification the following definitions shall be added:

Working area: The land and any other place on, under, over, in or through which the Works are to be executed or carried out, and any other land or place made available by the Employer in connection with the Works. The Working Area shall include the site office, construction camp, stockpiles, batching areas, the construction area, all access routes and any additional areas to which the Engineer permits access. The construction footprint must be kept to a minimum.

SDEMA3 MATERIALS
SDEM3.1 Materials handling, use and storage (Subclause 4.1.1)

The Engineer shall be advised of the areas that the Contractor intends to use for the stockpiling of both natural and manufactured materials. No stockpiling shall occur outside of the working area (as designated by the engineer) and without the Engineer's prior approval of the proposed stockpiling areas. Imported material shall be free of litter, contaminants or exotic plant seed. The Contractor shall ensure that material is not stockpiled along the border of any water body (permanent or seasonal).

Location and treatment of material stockpiles shall take consideration of prevailing wind directions and dwellings. Stockpiles shall be stored under cover so as to prevent erosion and run off during rainy periods. . No rubble, earth or other material shall be dumped within the Eskom servitude restriction area.

Topsoil (100 -200 mm) from construction areas where vegetation clearing is required shall be removed and stockpiled for rehabilitation purposes. This shall be spread over the top of the turbine foundation after the turbine has been erected and any other disturbed areas which are to be rehabilitated and seeded with indigenous species. Ground shall be returned as far as possible to original levels/gradients and any excess material shall not be left in piles, but shall be removed off-site.

Dust suppression measures shall be used particularly during dry periods of weather during the summer months.

All materials on the construction sites should be properly stored and contained. Storage of materials and builders' rubble shall be screened from public view.

Cut material shall be used, where possible in construction or on site (e.g. in grading gravel roads), or removed from site.

SDEM3.2 Hazardous substances (Subclause 4.1.2)

Procedures detailed in the Materials Safety Data Sheets (MSDS) shall be followed in the event of an emergency situation.

Potentially hazardous substances shall be stored, handled and disposed of as prescribed by the Engineer.

An effective monitoring system to detect any leakage or spillage of all hazardous substances during their transportation, handling, use and storage shall be compiled and implemented. This shall include precautionary measures to limit the possibility of oil and other toxic liquids from entering the soil or storm water systems.

SDEM3.3 Shutter oil and curing compound (Subclause 4.1.2.1)

Shutter oil and curing compound shall be stored and dispensed within a bunded area, and not located closer than 32 m from the top of the river banks/water courses/drainage lines.

SDEMA4 REQUIREMENTS

SDEMA4.1 Ablution facilities (Subclause 4.2.1)

A sufficient number of chemical toilets shall be provided by the Contractor in the construction camp area and at appropriate locations approved by the Engineer. Temporary/ portable toilets shall not be located within 100 m from the top of the river banks/water courses/drainage lines. Any septic tanks constructed for the project should be located at least 100 m (measured from top of bank) from the ephemeral streams and at least 1 000 m away from the springs or any boreholes/wellpoints. The ratio of ablution facilities for workers should not be less than that required by the Construction Regulations of 2003 of the Occupational Health and Safety Act. All

temporary/ portable toilets shall be secured to the ground to prevent them from toppling due to wind or any other cause.

SDEMA4.2 Solid Waste Management (Subclause 4.2.2)

Hazardous wastes (if any) shall only be sent to landfill sites registered for hazardous wastes. Burying or burning of solid waste shall be prohibited on site. A waste management system shall be established to ensure regular waste removal and disposal at a licensed landfill.

SDEMA4.3 Contaminated Water (Subclause 4.2.3)

The Contractor shall prevent the discharge of any pollutants, such as soaps, detergents, cements, concrete, lime, chemicals, hydrocarbons, glues, solvents, paints and wastewater into the surrounding terrestrial and aquatic environment. Should any discharge be necessary it will require the engineer's approval prior to discharging any contaminated water into a lined sump, which will allow sediment particles to settle. Surface contaminants shall be separated by skimming off the surface. Dried particulates collected from the sump and skimmed pollutants such as oils and petrochemicals shall be collected and disposed of at a registered landfill site. The remaining water shall then be drained into an unlined drainage pond where the water can filter into the ground. The pond shall be located in an area approved by the ECO and Engineer. To excavate the pond the top 300 mm of soil shall be removed and stored separately. Once construction is complete the pond shall be backfilled and the top material replaced to cover the area for rehabilitation.

SDEMA4.4 Site Structures (Subclause 4.2.4)

No site structures shall be located within 32 m from the top of the river banks/water courses/drainage lines. Construction yards should be restricted in extent as far as possible and should be screened by visually impermeable material.

Ensure the camp is neat and tidy at all times. Site offices, if required, should be limited to single storey and should be sited carefully using temporary screen fencing to screen from the wider landscape.

Where site offices are required, these shall be limited to single storey and temporary screen fencing used to screen offices from the wider landscape.

SDEMA4.5 Noise control (Subclause 4.2.5)

Construction traffic shall be routed as far as practically possible from potentially sensitive receptors.

A good working relationship between the developer and all potentially sensitive receptors shall be ensured by establishing communication channels to ensure prior notice to the sensitive receptor if work is to take place close to them. Information that should be provided to the potential sensitive receptor(s) include:

- Proposed working times;
- how long the activity is anticipated to take place;
- what is being done, or why the activity is taking place;
- contact details of a responsible person where any complaints can be lodged should there be an issue of concern.

When working within 500 m of a potential sensitive receptor, the number of simultaneous activities (e.g. construction of access roads, trenches, etc) shall be limited to the minimum as far as possible. Furthermore, working time shall be co-ordinated with periods when the receptors are not at home, where possible. An example would be to work within the 08:00 to 14:00 time-slot to minimize the significance of the impact because potential receptors are most likely at school or at work, minimizing the probability of an impact happening.

Use of the smallest/quietest equipment for the particular purpose shall be considered.

Ensure that equipment is well-maintained and fitted with the correct and appropriate noise abatement measures.

- Ensure equivalent A-weighted daytime noise levels below 45 dBA at potentially sensitive receptors ;
- Ensure that maximum noise levels at potentially sensitive receptors be less than 65 dBA;
- Prevent the generation of disturbing or nuisance noises for example a transformer must be placed more than 200m away from any house
- Ensure acceptable noise levels (SANS guidelines) at surrounding stakeholders and potentially sensitive receptors;
- Ensuring compliance with the Noise Control Regulations;
- Ensure a good working relationship between the developer and all potentially sensitive receptors. Communication channels should be established to ensure prior notice to the sensitive receptor if work is to take place close to them (within 500 m). Information that should be provided to the potential sensitive receptor(s), at least 2 days before the work takes place, include:
  - Proposed working times;
  - how long the activity is anticipated to take place;
  - what is being done, or why the activity is taking place;
  - contact details of a responsible person where any complaints can be lodged should there be an issue of concern.

- If any noise complaints are received, noise monitoring should be conducted at the complainant, followed by feedback regarding noise levels measured.
- The construction crew must abide by the local by-laws regarding noise; andWhere possible construction work should be undertaken during normal working hours (06H00 – 22H00; adopted from SANS 10103:2008.), from Monday to Saturday; If agreements can be reached (in writing) with the all the surrounding (within a 1 km) potentially sensitive receptors, these working hours can be extended.

SDEMA4.6 Fuel (Petrol and Diesel) and oil (Subclause 4.2.7)

Fuels in the form of diesel and petrol shall not be stored within 32 m from the top of any river banks/water courses/drainage lines.

SDEMA4.7 Equipment Maintenance and Storage (Subclause 4.2.8)

Wastewater generated from construction or the washing of vehicles shall not be permitted to enter water courses, either directly or via a stormwater system.

SDEMA4.8 Stormwater Erosion Control (Add Section 4.2.10)

A stormwater management plan shall be compiled and implemented. The plan shall ensure compliance with applicable regulations and prevent off-site migration of contaminated storm water or increased soil erosion. The plan shall include the construction of appropriate design measures that allow surface and subsurface movement of water along drainage lines so as not to impede natural surface and subsurface flows. Drainage measures shall promote the dissipation of storm water run-off. Establish the stormwater system as a priority, so that all runoff is led to the designated drainage from the site.

The Contractor shall take reasonable measures to control the erosive effects of stormwater runoff. Any runnels or erosion channels developed during the construction period or during the maintenance period shall be backfilled and compacted to limit the impacts of sediment deposition into the surrounding aquatic environment.

Run-off over any exposed areas should be mitigated to reduce the rate and volume of run-off and prevent erosion occurring on the site and within the freshwater features and drainage lines. Contaminated runoff from the construction site(s) should be prevented from entering any rivers/streams.

SDEMA4.9 Method Statements (Subclause 4.3.1)

The following additional method statements shall be provided by the Contractor within 14 days of the receipt of the Letter of Acceptance and prior to the activity covered by the Method Statement being undertaken:

- Logistics for the environmental awareness course for all the Contractors employees.
- Emergency procedures for fire, accidental leaks and spillages of hazardous materials including:
  - who shall be notified in the event of an emergency, including contact numbers for the relevant local authority,
  - where and how any hazardous spills will be disposed of,
  - the size of spillage which the emergency procedures could contain,
  - location of all emergency equipment and an indication of how regularly the emergency equipment will be checked to ensure that it is working properly.
- Location and layout of the construction camp in the form of a plan showing offices, stores for fuels, hazardous substances, vehicle parking, access point, equipment cleaning areas and staff toilet placement.

- Location, layout and preparation of cement/concrete batching facilities including the methods employed for the mixing of concrete and the management of runoff water for such areas. An indication shall be given of how concrete spoil will be minimised and cleared.
- Method of undertaking earthworks, including spoil management, erosion, dust and noise controls.
- Method of undertaking blasting.
- Management measures to be undertaken in instances where traffic flows may be interrupted.
- Extent of areas to be cleared, the method of clearing and the preparation for this clearing so as to ensure minimisation of exposed areas.
- Measures to be put in place during temporary closure periods, e.g. December holidays.
- Measures to be put in place to limit sediment deposition into the surrounding terrestrial and aquatic environment.

SDEMA4.10 Site Clearance (Subclause 4.3.4)

The Contractor shall strip the top material and root material of cleared vegetation (top 100-200 mm layer), for subsequent use during rehabilitation and re-vegetation. Top material shall be stripped from all areas of the Working Area where topsoil will be impacted by construction activities, including areas for temporary facilities, as directed by the Engineer. The Contractor shall not make use of herbicides or other chemical methods to clear the proposed site especially near the identified water courses. In order to limit erosion the Contractor shall retain original groundcover, as far as practically possible, adjacent to the aquatic environment and to the trenching line.

SDEMA4.11 No go areas (Subclause 4.3.7)

All works to be undertaken shall be within the boundary of the site. A “no go” area shall extend on either side of the working area i.e. all areas outside of the defined working area and designated access roads. The working area shall be demarcated in an appropriate manner determined by the Engineer. The “no-go” area shall be demarcated by a semi-permanent fence to prevent workers from entering the undisturbed areas.

Based on the ecological importance, all construction activities shall remain outside of all aquatic environments, with special efforts implemented to maintain a 32 m buffer between construction related activities and any rivers/water courses/drainage lines. These no go areas shall stay in place until construction of the infrastructure within the buffer area must commence.

The recommended ecological sensitivity and buffer areas indicated in **Figure 1.1 & 1.2** shall be demarcated as “no go” areas and construction activities shall remain outside these designated areas. These include the following no - go heritage areas: (i) “Orange Hill” with a buffer of 700 m,(ii) “SMS Hill” with approximately a 450 m buffer from all recorded heritage sources, (iii) “Gobeesvlei and its immediate surroundings with a buffer of 350 m and (iv) Springbokvlei with a buffer of 200 m. Old buildings shall be fenced off during construction to avoid vandalism of the

buildings, kraal complexes must be avoided and access roads re-routed to avoid damage to the buildings.

No mechanical equipment, including mechanical excavators or high lifting machinery, shall be used in the vicinity of Eskom's apparatus and/or services, without prior written permission having been granted by Eskom. If such permission is granted the Contractor must give at least seven working days' notice prior to the commencement of work. This allows time for arrangements to be made for supervision and/or precautionary instructions to be issued by the relevant Eskom Manager Note: Where and electrical outage is required, at least fourteen work days are required to arrange it.

No equipment associated with earthworks shall be allowed outside of the site and defined access routes, or within "no go" areas, unless expressly permitted by the Engineer.

SDEMA4.12 Protection of flora and fauna (Subclause 4.3.9)

No flora shall be removed or damaged, outside of the designated working area, without specialist botanical input. The collection of firewood by construction workers should be prohibited.

Any snakes found on site shall be removed from site and released into an area away from the site, without harm.

The contractor shall ensure that the time a trench is left exposed is kept to a minimum, and that open trenches are inspected on a daily basis for animals which may have fallen or become trapped. Any animals found trapped in any trenches shall be freed without harm.

A vegetation rehabilitation plan shall be compiled and implemented with the aid of a rehabilitation specialist. The specialist is to recommend species to be used in rehabilitation as well as any special measures for rehabilitation such as shade-netting and alien vegetation removal. Restoration shall be undertaken as soon as possible after completion of construction activities to reduce the amount of habitat converted at any one time and to speed up the recovery to natural habitats. Where indigenous vegetation will be affected, a plant rescue and protection plan shall be compiled and implemented which allows for the maximum transplant of conservation important species from areas to be transformed. This plan will be compiled by a vegetation specialist familiar with the site and be implemented prior to commencement of the construction phase.

Any of the cleared areas onsite that are not hardened surfaces shall be rehabilitated after construction is completed by revegetating the areas disturbed by the construction activities with suitable indigenous plants. Any disturbed areas shall be monitored to ensure that these areas do not become subject to erosion or invasive alien plant growth.

An alien invasive management plan shall be compiled and implemented. The plan shall include mitigation measures to reduce the invasion of alien species and ensure that the continuous monitoring and removal of alien species is undertaken.

An open space management plan shall be compiled and implemented.

Disturbance associated with the operation of the facility shall be minimised, by scheduling maintenance activities to avoid and/or reduce disturbance in sensitive areas at sensitive times– such areas will be identified during the pre-construction and operational monitoring.
An avifauna and bat monitoring programme shall be compiled and implemented to document the effect of the construction period on avifauna and bats. This will be compiled by a qualified specialist.

SDEMA4.13 Protection of archaeological and palaeontological remains (Subclause 4.3.10)

The ECO shall be alert to the two known fossil sites within the site as well as possibility of fossil remains being found either on the surface or exposed by fresh excavations during construction. Should substantial fossil remains be exposed during construction, these should be safeguarded by the ECO, preferably *in situ*, and the South African Heritage Resources Association (SAHRA) should be notified by the ECO so that appropriate mitigation can be undertaken.

In the case of unexpected exposure of below-ground archaeological or fossil material during excavations, SAHRA must be consulted immediately to ensure timeous implementation of appropriate mitigation measures. In the event of accidental uncovering of graves, work must stop immediately and the SAHRA Burials Unit must be notified. An archaeologist or palaeontologist shall be involved to assist with the investigation and procedures to address the situation.

SDEMA4.14 Access routes/ haul roads (Subclause 4.3.11)

Access roads shall be kept tidy.

Eskom's rights and services shall be acknowledged and respected at all times. Unobstructed access shall be granted to Eskom to access their servitudes.

The contractor shall ensure that all regulations relating to traffic management are observed and local traffic officials are informed of the proposed construction activities. As far as possible, attempts shall be made to ensure that high construction related road usage coincides with low traffic flow periods.

Turbine components shall be transported overnight as far as possible.

Signage and safety measures during the construction of the access roads shall comply with the guidelines as set out in the latest issue of the SADC Road Traffic Signs Manual. Standard "construction ahead" warning signs should be placed on all relevant roads in the area. Ensure access roads are kept clean and storage of materials is screened.

A traffic management plan for the site access roads shall be compiled and implemented to ensure that no hazards would results from the increased truck traffic and that traffic flow would not be adversely impacted. This plan shall include measures to minimize impacts on local commuters e.g. limiting construction vehicles travelling on public roadways during the morning and late afternoon commute time and avoid using roads through densely populated built-up areas so as not to disturb existing retail and commercial operations.

A transportation plan shall be compiled and implemented for the transport of turbine components, main assembly cranes and other large pieces of equipment.

SDEMA4.15 Cement and concrete batching (Subclause 4.3.12)

No cement and / or concrete batching shall occur within the “no-go” areas or within 32 m from the top of any river banks/water courses/drainage lines. Reasonable measures shall be implemented to limit contaminated surface run-off into the surrounding vegetation.

SDEMA4.16 Earthworks (Subclause 4.3.13)

Any blasting is to be executed by a suitably qualified person.Controlled blasting techniques shall be employed to minimise dust and fly rock during blasting.

Blasting should not take place during the breeding seasons (mostly spring) of the resident avifaunal community (as determined by avifaunal monitoring) and in particular for priority bird species.

The use of explosives of any type within 500 m of Eskom’s services shall only occur with Eskom’s previous written permission. If such permission is granted the Contractor must give at least fourteen working days prior notice of the commencement of blasting. This allows time for arrangements to be made for supervision and/or precautionary instructions to be issued in terms of the blasting process. It is advisable to make application separately in this regard.

Prior to blasting the Contractor shall notify the relevant occupants/ owners of surrounding land and address any concerns. Buildings within the potential damaging zone of the blast shall be surveyed preferably with the owner present, and any cracks or latent defects pointed out and recorded either using photographs or video. All Local Authority regulations are to be adhered to and all service infrastructures are to be located prior to commencement of blasting activities.

Blasting or drilling shall take place during normal working hours. The Contractor shall notify emergency services, in writing, a minimum of 24 hours prior to any blasting activities commencing on site. Adequate warning must be issued to all personnel on site prior to blasting activities taking place. All legally required signals are to be clearly indicated. The Engineer shall be issued daily updates of the days intended blasting activities.

The Contractor shall prevent damage to special features and the general environment, which includes the removal of flyrock. Damage caused by blasting / drilling shall be repaired to the satisfaction of the Engineer.

Minimise areas disturbed at any one time and protect exposed soil against wind erosion, e.g. by dampening with water or covering with hessian.

Changes in ground level may not infringe statutory ground to conductor clearances or statutory visibility clearances with respect to existing powerlines onsite. Clearances between Eskom's live electrical equipment and the proposed construction work shall be observed as stipulated in terms of Regulation 15 of the Electrical Machinery Regulations of the Occupational Health and Safety Act, 1993 (Act 85 of 1993)at all times.

SDEMA4.17 Community relations (Subclause 4.3.18)

Maintain a register that shall contain details of the measures taken to resolve complaints and the details of the communication of these measures to the person who raised the complaint.

SDEM4.18 Erosion and sedimentation control (Subclause 4.3.19)

Where necessary, sedimentation barriers shall be laid between the Work Area and the "no-go" areas to limit sediment deposition. The sedimentation barrier shall consist of a geotextile fabric stretched across and attached to supporting posts and stabilised with sandbags. The barrier shall be inspected daily and any damage shall be repaired immediately. Sediment deposits shall be removed once they reach half the height of the barrier.

An erosion management plan for monitoring and rehabilitating erosion events associated with the facility shall be compiled and implemented. Appropriate erosion mitigation shall form part of this plan to prevent and reduce the risk of any potential erosion. Construction activities should as far as possible be limited to the identified sites for the proposed wind and solar energy facilities and the identified access routes.

Where access routes need to be constructed through ephemeral streams, disturbance of the channel should be limited.

Clearing of debris, sediment and hard rubble associated with the construction activities should be undertaken post construction to ensure that flow within the drainage channels are not impeded or diverted. Rehabilitate disturbed stream bed and banks and revegetation with suitable indigenous vegetation. A Stormwater Management Plan must be compiled to manage the run off from the solar energy facility. Storm water run-off infrastructure must be maintained to mitigate both the flow and water quality impacts of any storm water leaving the energy facilities site. Should any erosion features develop, they should be stabilised as soon as possible.

SDEMA4.19 Site closure and rehabilitation (Subclause 4.3.28)

All construction debris found within the disturbed areas shall be removed and disposed of at a registered landfill site.

A vegetation rehabilitation plan shall be compiled with the aid of a rehabilitation specialist, for inclusion in the Construction EMP. The plan shall recommend species to be used in rehabilitation as well as any special measures for rehabilitation such as shade-netting and alien vegetation removal. The construction footprint associated with the activity shall be re-vegetated with indigenous vegetation, as directed by the rehabilitation plan. Disturbed areas shall be rehabilitated as soon as possible after construction.

Vegetated areas should preferably be watered if planted in the dry season to aid in establishment of plants; alternately rehabilitation should take place in the wet season; or as agreed with the rehabilitation specialist in the rehabilitation plan.

SDEMA4.20 Labour requirements (Add Subclause 4.3.32)

Recruitment shall be based on sound labour practices and with gender equality in mind. Obtain a list of locally available labour and skills. Preference shall be given to local communities.

Appropriate training shall be provided to enable individuals to apply their skills to other construction and development projects in the region once the construction phase is completed.

SDEMA5 COMPLIANCE WITH REQUIREMENTS AND PENALTIES

SDEMA5.1 Penalties (Subclause 5.2)

Stop order works will be issued for the transgressions listed below. Stop order works may be issued per incident at the discretion of the Engineer.

a) Any employees, vehicles, plant, or thing related to the Contractor's operations operating within the designated boundaries of a "no-go" area.
b) Any vehicle driving in excess of designated speed limits.
c) Persistent and unrepaired oil leaks from machinery.
d) Persistent failure to monitor and empty drip trays timeously.
e) The use of inappropriate methods for refuelling.
f) Litter on site associated with construction activities.
g) Deliberate lighting of illegal fires on site.
h) Employees not making use of the site ablution facilities.
i) Failure to implement specified noise controls
j) Failure to empty waste bins on a regular basis.
k) Inadequate dust control.
l) A spillage, pollution, fire or any damage to any watercourse/ wetland resulting from negligence on the part of the Contractor.
m) Any act, that in the reasonable opinion of the Engineer, constitutes a deliberate contravention of the requirements of these Specifications

The Engineer will determine what constitutes a transgression in terms of this clause, subject to the provisions of Clause 57(1) of the General Conditions of Contract. In the event that transgressions continue the Contractor's attention is drawn to the provisions of Sub-clause

55(1) of the General Conditions of Contract 2004 under which the Engineer may cancel the Contract.

5 OPERATIONAL FRAMEWORK EMP

The information is summarised in tabular format illustrating the activity, aspect, impact, mitigation measure, performance indicators, resources, schedule and verification. These criteria are listed and explained below:

The following components are identified/ described:

- **Activity**: component/ activity of the project for which the impact has been identified;
- **Aspect**: the aspect of the above activity which will be impacted;
- **Impact**: the environmental impact identified and to be mitigated;
- **Mitigation measure**: measures identified for implementation in terms of environmental management to reduce, rectify or contain the identified environmental impact – mitigation is divided into the following:
    - **Objective**: desired outcome of mitigation measure,
    - **Mechanism**: method of achieving the objective;
- **Performance indicators**: outcomes that will indicate achievement of objective/s;
- **Responsibility**: party or parties identified for implementation of mitigation measure/s;
- **Resources**: available resources to aid implementation of mitigation;
- **Schedule**: timeframe in which identified impact and mitigation measure is anticipated to occur; and
- **Verification**: party or parties identified as responsible for review and assessment of final outcome.

This section contains the Operational Framework EMP table which constitutes the Operational Framework EMP. It is important to note that this Framework EMP has been compiled prior to authorisation of the proposed project and will be updated to include the conditions of the EA that will be issued by DEA as part of the EA.

Operational Framework Environmental Management Programme Table									
NO.	**ACTIVITY**	**ASPECT**	**IMPACT**	**MITIGATION MEASURE: (objective and mechanism)**	**PERFORMANCE INDICATOR**	**RESPONSIBILITY**	**RESOURCES**	**SCHEDULE**	**VERIFICATION**
1.	All Activities (wind energy facility)	Environmental management documentation and procedures	No framework within which to locate the management of the operational phase. No procedures against which to assess environmental performance during the operational phase and thus no measure of compliance.	**Objective:** To ensure that the operation of the WEF does not result in avoidable impacts on the environment, and that any impacts that do occur are anticipated and managed. **Mechanism:** 1) Appoint a suitably qualified ECO to monitor compliance (either independent or in-house). 2) Audit the compliance with the requirements of the environmental specification contained within the OEMP.	Environmental impacts effectively monitored and managed during the operational phase. Comprehensive record of compliance and remedial actions available to Mainstream and the authorities.	ECO Mainstream	OEMP	Twice in the 1st three years and then once every five years	Mainstream DEA
2.	Operational Activities (wind energy facility)	Protection of the surrounding environment (aquatic and terrestrial)	Effects that the operation and maintenance of the wind energy facility would have on the surrounding environment (including bats and avifauna)	**Objective:** To ensure that impacts on the surrounding biophysical environment are minimised during the operational phase. **Mechanism:** 1) Curtailment could be implemented to lessen bat mortalities and should be determined by long term bat monitoring which will	No dead birds or bats are found on site.	ECO Avifaunal Specialist Bat Specialist Mainstream	Environmental Management Procedures OEMP	As per the schedule of the avifaunal monitoring programme detailed in Section 5 below. As per the schedule of the bat monitoring	Mainstream DEA

Operational Framework Environmental Management Programme Table									
NO.	**ACTIVITY**	**ASPECT**	**IMPACT**	**MITIGATION MEASURE: (objective and mechanism)**	**PERFORMANCE INDICATOR**	**RESPONSIBILITY**	**RESOURCES**	**SCHEDULE**	**VERIFICATION**
				indicate at which turbines, seasons, time of night and in which weather curtailment is required. 2) Consider implementing an ultrasonic deterrent device so as to repel bats from wind turbines. Should this measure prove effective it may be implemented in place of curtailment, 3) Undertake affordable long term monitoring of bats and the potential impacts of turbines on them and fine tune mitigation based on the outcome of the monitoring programme compiled with the aid of a bat specialist[4]. 4) Implement mitigation measures for protection of avifauna based on the outcome of the avifaunal				programme to be established.	

[4] This should include 12 month long term monitoring (preferably prior to construction) where bat detectors are deployed on the site and passively recording bat activity every night. Additionally the site should be visited by a bat specialist quarterly to assess and compare the bat activity on a seasonal basis. The wind speed data gathered by meteorological masts can then be correlated with bat activity to determine the most feasible cut-in speed and fine tune other mitigation measures.

Operational Framework Environmental Management Programme Table									
NO.	**ACTIVITY**	**ASPECT**	**IMPACT**	**MITIGATION MEASURE: (objective and mechanism)**	**PERFORMANCE INDICATOR**	**RESPONSIBILITY**	**RESOURCES**	**SCHEDULE**	**VERIFICATION**
				monitoring programme.					
3.	All Activities (wind energy facility)	Protection of the surrounding environment (aquatic and terrestrial)	Effects that the operation and maintenance of the wind energy facility would have on the surrounding environment (including local flora, fauna, bats, avifauna and watercourses around the proposed development.	**Objective:** To ensure that impacts on the surrounding biophysical environment are minimised during the operational phase. **Mechanism:** 1) During maintenance activities limit movement to disturbed areas. 2) Limit operational activities as far as possible to the delineated site footprint and access routes. 3) Any areas disturbed during maintenance should be rehabilitated. 4) Ensure ongoing implementation of the storm water management plan to ensure compliance with applicable regulations and prevent off-site migration of contaminated storm water or increased soil erosion. 5) Ensure ongoing implementation of the alien invasive and	The surrounding environment including aquatic and terrestrial ecology is not impacted on.	ECO Mainstream	Environmental Management Procedures OEMP	As maintenance is required on site.	Mainstream DEA

Operational Framework Environmental Management Programme Table									
NO.	**ACTIVITY**	**ASPECT**	**IMPACT**	**MITIGATION MEASURE: (objective and mechanism)**	**PERFORMANCE INDICATOR**	**RESPONSIBILITY**	**RESOURCES**	**SCHEDULE**	**VERIFICATION**
				vegetation rehabilitation management plans .					
4.	All Activities (wind energy facility)	Environmental management of the operational phase	Positive impacts on socio-economic environment during operation	**Objective:** To ensure that the operation of the wind energy facility maximises positive impacts on the socio-economic environment. **Mechanism:** 1) Train local people for operation and maintenance of facility. 2) Employ local labour for the operational phase, where possible, and particularly for day to day operations and maintenance.	Consult annual skills and training records, employment records and proof of staff residency in the area prior to employment	ECO Mainstream	Environmental Management Procedures OEMP	During Operational Phase (full lifetime) when the need arises to employ people.	Mainstream DEA
5.	All Activities (wind energy facility)	Visual aesthetics	Impact of the proposed development on the surrounding visual aesthetics of the area	**Objective:** To ensure that impacts on the visual aesthetics are minimised during the operational phase. **Mechanism:** 1) During operation, the maintenance of the turbines, the internal roads, the power line servitude and other ancillary structures and infrastructure will ensure that the facility	Condition of the project infrastructure and roads.	Mainstream	Environmental Management Procedure OEMP	As required based on annual inspections of the project	Mainstream DEA

Operational Framework Environmental Management Programme Table									
NO.	**ACTIVITY**	**ASPECT**	**IMPACT**	**MITIGATION MEASURE: (objective and mechanism)**	**PERFORMANCE INDICATOR**	**RESPONSIBILITY**	**RESOURCES**	**SCHEDULE**	**VERIFICATION**
				does not degrade, thus aggravating visual impact. 2) Turbines should not display brand names. 3) Turbines should be maintained in operational condition. 4) Storm water run-off infrastructure must be maintained to mitigate both the flow and water quality impacts of any storm water leaving the energy facilities site. Should any erosion features develop, they should be stabilised as soon as possible.					

6 DECOMMISSIONING

6.1 Decommissioning of the proposed wind energy facility

The turbine infrastructure which would be utilised for the proposed project is expected to have a lifespan of approximately 20 - 30 years (with maintenance). Generally a power purchase agreement (PPA) of 20 years is signed with the energy buyer. After the PPA comes to an end the PPA may be renegotiated at terms that are financially viable at that point in time. The PPA may be based on a shorter term agreement using the existing turbines (if the existing turbines are still suitable) or a longer term PPA may be negotiated based on re powering (refurbishment) of the proposed wind energy facility. It is most likely that refurbishment of the infrastructure of the facility discussed in this EIA would comprise the disassembly and replacement of the turbines with more appropriate technology/infrastructure available at that time. New turbine technology may also reduce potential environmental impacts.

Where no new PPA can be negotiated it is likely that the wind farm would be decommissioned according to requirements in the EMP and as required by any other legislation/regulations at that time.

The following decommissioning and/or repowering activities have been considered to form part of the project scope of the proposed wind energy facility:

6.1.1 Site preparation

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

6.1.2 Disassemble and replace existing turbines

A large crane would be brought on site. It would be used to disassemble the turbine and tower sections. These components would be reused, recycled or disposed of in accordance with regulatory requirements. All parts of the turbine would be considered reusable or recyclable except for the blades. The land-use would revert back agriculture/ grazing.

6.2 Decommissioning phase of the proposed solar energy facility

The PV site has a project lifespan of approximately 20 years, based on the photo sensitivity life cycle of the panels. The loss in efficiency occurs due to various climatic conditions that contribute to their affectivity. However, as all the infrastructure, such as roads, transmission, substations and foundations would already be established, and the energy source (solar) is a renewable one the proposed project would continue to be operated after 20 years. The solar panels would be upgraded to make use of the latest technology available. All redundant

equipment that would need to be replaced would be removed from site and would be sold off or recycled.

6.3 Way Forward

If the facilities are decommissioned then the sites would be fully rehabilitated in accordance with requirements in terms of relevant legislation such as the National Environmental Management Act. All roads would be left on site, as it would assist the farmer in accessing his land, unless the farmer requires otherwise.

7 CONCLUSION

In conclusion it should be noted that the LEMP should be regarded as a living document and changes should be made to the LEMP as required by project evolution, while retaining the underlying principles and objectives on which the document is based.

The compilation of the LEMP has incorporated impacts and mitigation measures from the EIR as well as incorporating principles of best practice in terms of environmental management. By identifying the potential impacts, mitigation measures, performance indicators, responsibilities, available resources, potential schedule and verification responsibility, the LEMP has provided a platform on which both the construction phase and the operational phase EMPs can be founded. The LEMP has ensured that the individual EMPs will be able to incorporate mitigation measures based on the project in its entirety as opposed to phase-specific measures.

APPENDIX A
CURRICULUM VITAE OF ENVIRONMENTAL ASSESSMENT PRACTITIONERS

APPENDIX B
CONSTRUCTION EMP GENERAL SPECIFICATIONS (COMPREHENSIVE)