Report Number: 5948/ 107516

PROPOSED PHOTOVOLTAIC ENERGY PLANT ON FARM KLIPGATS PAN NEAR COPPERTON, NORTHERN CAPE

LIFE-CYCLE ENVIRONMENTAL MANAGEMENT PROGRAMME

JULY 2013

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PROJECT DETAILS

REFERENCE NO.	DEA Ref No. 12/12/20/2501 NEAS Ref. No. DEAT/EIA/0000611/2011
PROJECT NO.	107516
TITLE	Life-cycle Environmental Management Programme (Draft)
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REPORT STATUS	Draft
REPORT NUMBER	5948/106563
REPORT DATE	July 2013

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This report is to be referred to in bibliographies as: Aurecon (2013). Life-Cycle Environmental Management Programme (Draft) for the Proposed PV plant on farm Klipgats Pan, near Copperton Northern Cape. Report No. 5948/107516

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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
EIAR	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
SKA	Square Kilometre Array
SPEC EMA	Specification Environmental Management

1 OVERVIEW

This document represents the Life-Cycle Environmental Management Programme (LEMP) for the proposed photovoltaic (PV) solar energy plant, near Copperton, Northern Cape.

1.1 Purpose of the LEMP

The LEMP has been included in the Environmental Impact Assessment Report (EIAR) 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 of Regulation R544 (18 June 2010), Activity 1 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 EIA) 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 EIAR.

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 EIAR 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[1] *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".*

Section 24N (2) and (3) of the NEMA (as amended) listing the requirements of an EMP are given in **Table 1**.

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.

[1] Please note that DEA&DP's guideline is used even though the proposed project is based in the Northern Cape, as DEA has not compiled a guideline on EMPs.

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[2]. 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 3);
2. Construction EMP based on identified impacts and mitigation measures from the EIAR (Chapter 2);
3. Operational Framework based on identified impacts and mitigation measures from the EIAR (Chapter 5); and
4. Decommissioning Framework providing guidance on key considerations to be considered during decommissioning/closure (Chapter 7).

1.4 Expertise of Environmental Assessment Practitioners

Section 33 of EIA Regulations and Section 24N (2) and (3) of the 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**.

[2] 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 BACKGROUND INFORMATION

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 PV plant. 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

Mulilo Renewable Energy (Pty) Ltd (Mulilo) proposes to construct a PV plant to generate approximately 100 MW on the farm Klipgats Pan (Portion 4 of Farm No. 117) near Copperton in the Northern Cape. Klipgats Pan lies approximately 9 km to the south of Copperton and borders to the Kronos substation. The farm is approximately 2 620 ha in size and split into two portions by the R357.

In terms of associated infrastructures, the following would be required:

- Upgrade of existing internal farm roads and construction of new roads to accommodate the construction vehicles and access the site.
- Construction of a 132 kV transmission line to connect the proposed PV plant with Eskom's grid via the Cuprum substation.
- Electrical fence to prevent illegal trespassing and the possible theft of panels, as well as keeping livestock from roaming between the solar arrays and causing accidental damage.
- Other infrastructure includes an office, connection centre and a guard cabin.

2.2 Summary of Alternatives

To summarise, the feasible alternatives assessed in the EIAR included the following:

- Location alternatives:
  - One location for the proposed PV plant on Klipgats Pan; and
  - Electricity distribution via a 1.66 km or 2.14 km 132 kV connection to Kronos substation.
- Activity alternatives:
  - Solar energy generation via a PV plant; and
  - "No-go" alternative to solar energy production.
- Site layout alternatives:
  - Two layout alternatives.
- Technology alternatives:
  - Two technology alternative in terms of the solar panel type (PV vs. CPV);
  - Dual Axis tracking system to mount the panels; and
  - Four foundation options.

  Sensitive ecological areas identified on site during the EIA are shown in **Figure 2.1**.

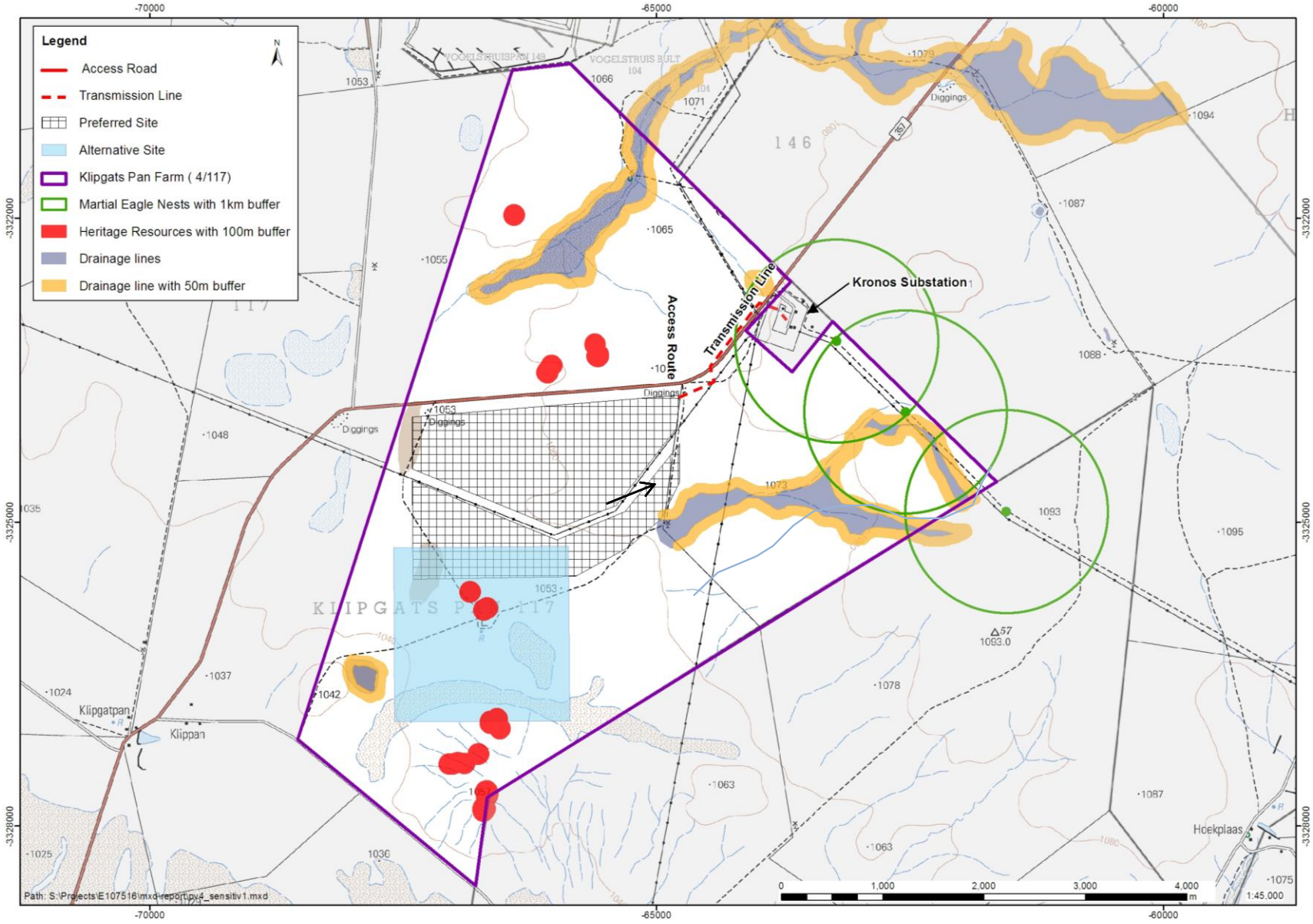

Figure 2.1 Sensitive ecological areas and the proposed project, including alternative layouts

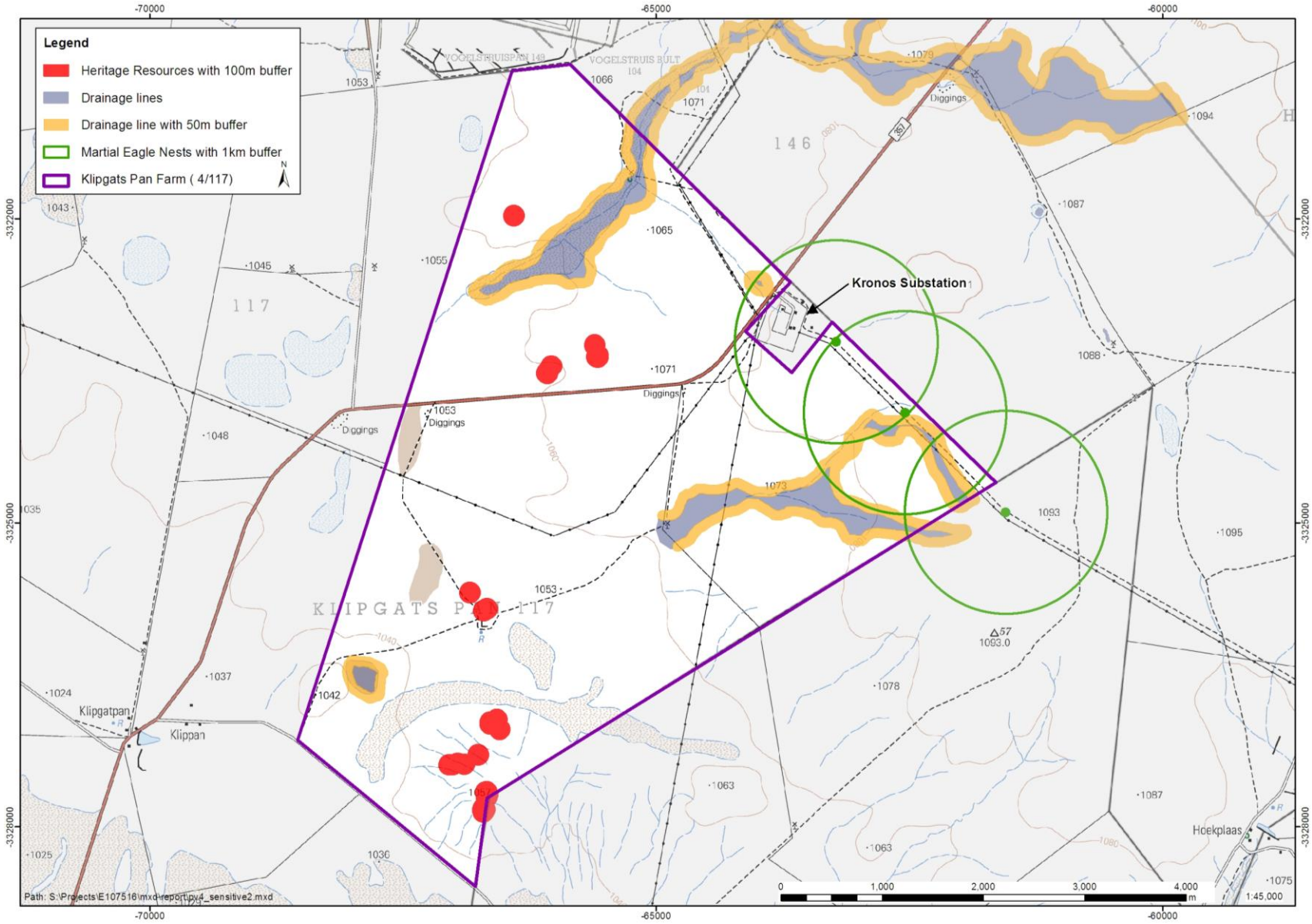

Figure 2.2 Sensitive ecological areas on site

3 PLANNING AND DESIGN

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.

3.1 Design of the Project

3.1.1 Botanical

- Locate the proposed project in such a way that the development footprint is minimized;
- Shallow depressions and well defined pans should be avoided, with buffer zones of at least 30 m around pans;
- Site clearance shall occur in sections and not all at once to limit the size of the area open to erosion;
- Compile a rehabilitation plan with the aid of a rehabilitation specialist;
- Position access roads in such a way that no clearing within no-go areas is necessary and definite drainage areas are avoided; and
- Design the construction of access roads for minimal impact.

3.1.2 Fauna

- Allow small ground level openings, 20-30 cm in height, in the electrical fence to facilitate the movement of small mammals and reptiles through the site.

3.1.3 Avifauna

- Minimise the footprint of the development;
- Implement planning and design mitigation measures for protection of avifauna based on the outcome of the comprehensive bird monitoring programme as per the guidelines provided in Section 6 of this LEMP;
- Should above-ground power lines be used, bird-safe structures (ideally with critical air gaps greater than 2 m) shall be used; and
- The length of any above-ground power lines shall be minimised and all new lines should be marked with bird flight diverters.

3.1.4 Heritage

- Prior to construction, a heritage specialist must undertake a final site examination. Mitigation shall be undertaken prior construction on all additional mitigation worthy sites identified;
- Test excavations around pans impacted on by the PV plant shall be undertaken prior to construction to check for buried archaeological material. If avoiding sensitive archaeological sites is not feasible, sampling and recording of the archaeological site before its destruction must be undertaken;
- Where archaeological sites are threatened by construction activities, these should be mitigated by excavation and sampling of the sites before the start of construction (see **Figure. 2.1 and 2.2**); and
- A 100 m buffer zone should be implemented from the edge of the pans for sites situated alongside the pans and for transmission lines.

3.1.5 Visual

- New structures should be placed where they are least visible to the greatest numbers of people, i.e. in places where the topography can offer shielding (where possible);
- Site offices, if required, shall be limited to a shingle storey and shall be sited carefully using temporary screen fencing to screen from the wider landscape;
- Visibility of buildings and the local sub-station should be reduced by cladding the buildings in non-reflective colours and materials that would blend in with the natural environment. E.g. cladding with local stone or plaster and paint with earthy tones for paint colours, roofs should be grey and non-reflective and doors and window frames should reference either the roof or wall colours; and
- Finishing materials for the infrastructure (including support structures) should be of colours that are non-reflective and in dark matte colours such as dark grey or charcoal.

3.1.6 Surface Water

- A monitoring plan for soil chemistry and erosion should be implemented due to potential impacts resulting from panel cleaning;
- Channel runoff should be diverted in such a way as to minimise erosion and if necessary, soil stabilising techniques should be implemented in vulnerable areas;
- Stormwater channels and “mitre” chutes should be constructed to direct the stormwater flows and minimize and control erosion. Where relevant, separate Each catchment covered by the site should have a separate drainage system and associated detention pond;
- The minor storm design period should be used to determine the size of the earth channels. A return period of 1:5 years is applicable which approximates to an average intensity of 30 mm/hour;
- The minor storm design period should be used to determine the size of the earth channels. A return period of 1:5 years is applicable which approximates to an average intensity of 29 mm/hour;
- The major storm occurrence (i.e. 1:25 year, 1:50 year & 1:100 year) should be used to calculate culverts in defined drainage lines and determine flood levels where necessary. The intensities for each occurrence are: 1:25 year – 45 mm/hour, 1:50 year – 52 mm/hour and 1:100 year – 60 mm/hour respectively;
- Low-lying depressions and watercourses should be avoided wherever possible; and
- Shallow depressions and well defined pans shall be avoided and buffered by at least 30 m.

3.1.7 Internal Roads

- Roads should be designed to have minimal impact on the environment;
- Gravel roads should be graded and shaped with a 2 % crossfall back into the slope, allowing stormwater to be channelled in a controlled manor towards the natural drainage lines;
- Where roads intersect natural, defined drainage lines, suitably sized pipe culverts or drive through causeways should be installed or constructed; and
- Where internal roads need to be realigned, these should not cross drainage lines (where possible).

3.1.8 Land use

- A detailed impact analysis should be undertaken together with the South African SKA Project Office (SASPO) to identify mitigation measures for the construction and operation of the PV facility.

3.1.9 Sedimentation and Erosion

- Site clearance and earth moving activities should take place in the dry season as far as possible to prevent erosion and limit disturbances to surface areas;
- The proposed project should be located away from the no-go areas, as well as a 30 m buffer area around these no-go areas; and
- Access roads should be positioned in such a way that no clearing within no-go areas is required and definite drainage areas should be avoided. Should additional access roads be required, these should be built with culverts to prevent the impediment of water movement.

3.1.10 Transport

The roads authorities shall be contacted prior to construction to ensure that the necessary road upgrades, permits, traffic escorts, etc. are scheduled.

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.

4.1 Construction EMP General Specifications

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

4.2 Project Specifications

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 project and will accordingly be binding on the Contractor.

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.

Interpretations: This Specification contains clauses specifically applicable and related to the environmental requirements for the solar energy facility, near Copperton, 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:
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.

4.3 Specification Data: Environmental Management (SDEMA)

SDEM 4.3.1 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), including pans or within close proximity to no-go areas.

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.

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

SDEM 4.3.2 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.

SDEM 4.3.3 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 river banks / water courses / drainage lines.

4.4 Requirements

SDEM 4.4.1 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 32 m from the top of the river banks/water courses / drainage lines. The ratio of ablution facilities for workers shall 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.

SDEM 4.4.2 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 general waste removal.

SDEM 4.4.3 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 (Environmental Control Officer (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.

SDEM 4.4.4 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.

Site offices, if required, shall be limited to single storey and shall be sited carefully using temporary screen fencing to screen from the wider landscape.

SDEM 4.4.5 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 the river banks / water courses / drainage lines.

SDEM 4.4.6 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.

SDEM 4.4.7 Stormwater Erosion Control (Add Section 4.2.10)

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. Monitoring, together with the development of an environmental management plan as construction and operation proceeds, shall be required. Erosion control measures shall be implemented should there be evidence of erosion.

Establish the stormwater system as a priority, so that all runoff is led to the designated drainage from the site.

Construction activities shall be scheduled to take place in the dry season (winter) as far as possible.

Perennial alien species such as *Prosopis glandulosa (P. glandulosa)* shall be removed from sites disturbed or cleared, or where panel washing occurs.

A monitoring plan for soil chemistry and erosion shall be implemented due to potential impacts resulting from panel cleaning. Should soil chemistry be affected (this is likely to be an increase in salinity), the nature of the washing mixture could be changed, or acceptable waste treatment employed.

SDEM 4.4.8 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, and
  - 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 (if required).
- 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.

SDEM 4.4.9 Site Clearance (Subclause 4.3.4)

The Contractor shall strip the top material and root material of cleared vegetation (top 100-150 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.

Site clearance shall occur in sections as required and rehabilitated according to the Rehabilitation Plan (see SDM 4.4.11), as soon as the work on that specific section has been completed.

SDEM 4.4.10 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 30 m buffer between construction related activities and any rivers / water courses / drainage lines identified as no-go areas. These no go areas shall stay in place until construction of the infrastructure within the buffer area must commence.

The recommended 30 m buffer around the pan indicated in Figure 2.1 and 100 m buffer around heritage resources (see Figure 2.1) shall be demarcated as “no go” areas and construction activities shall remain outside these designated areas.

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.

SDEM 4.4.11 Flora, avifauna and fauna (Subclause 4.3.9)

A vegetation rehabilitation plan shall be compiled and implemented with the aid of a suitably qualified rehabilitation specialist, for inclusion in the Construction EMPr. The rehabilitation specialist shall recommend species to be used in rehabilitation as well as any special measures required, e.g. shade-netting and alien vegetation removal. Furthermore, 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.

Topsoil (300 mm) from construction areas where vegetation clearing is required shall be removed and stockpiled for rehabilitation purposes as per the requirements of the Rehabilitation Plan. The site shall be cleared in sections as required for construction and not all at once. Rehabilitation shall start immediate in accordance to the rehabilitation plan. Furthermore, perennial alien species such as *P. glandulosa* shall be removed from areas disturbed or cleared during construction and disposed of in an appropriate manner to prevent re-establishment and / or spreading of these species.

No flora shall be removed or damaged, outside of the designated working area, without specialist botanical input. The collection of firewood by construction workers is prohibited. *P. glandulosa* trees and / or shrubs growing within 250 m of the boundary of the PV plant footprint and the power-line route shall be eradicated by cutting and treating with herbicide to prevent coppicing.

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.

The construction phase shall be closely monitored by an Environmental Control Officer who shall identify areas that require rehabilitation in the post-construction phase.

SDEM 4.4.12 Protection of archaeological and paleontological remains (Subclause 4.3.10)

The no-go areas and their buffer zones shall be cordoned off during the construction phase. The complex LSA sites on the hill to the south, as well as the historical buildings on the alternative site shall be demarcated as a no-go area during construction. Destruction of these structures would require a detailed survey and recording of the entire complex, as well as a permit from the relevant heritage authority.

The engineer shall be briefed on the recording requirements by the archaeologist before excavations are done. This report must be submitted to the consultant archaeologist for dissemination to SAHRA to aid others in the development of a broader understanding of the Pleistocene landscape of this area.

Test excavations around pans impacted on by the PV plant shall be done before construction to check for buried archaeological material. If avoiding sensitive archaeological sites is not feasible, sampling and recording of the archaeological site before its destruction must be undertaken.

Archaeological sites shall be mitigated by excavation and sampling of sites before the start of construction should they be threatened by construction activities. In the event of accidental uncovering of graves or substantial fossil remains (e.g. vertebrate bones and teeth, large blocks of petrified wood), work must stop immediately and these should be safeguarded by the ECO, preferably *in situ*. South African Heritage Resources Association (SAHRA) should be notified of the findings. An archaeologist / palaeontologist should be involved to assist with the investigation and procedures to address the situation.

SDEM 4.4.13 Access routes/ haul roads (Subclause 4.3.11)

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. Furthermore, 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 and that that all road junctions have good sightlines.

The roads authorities shall be contacted prior to construction to ensure that the necessary road upgrades, permits, traffic escorts, etc. are scheduled.

All access roads are to be kept tidy, and measures shall be taken to minimise dust from construction traffic on gravel roads.

SDEM 4.4.14 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 river banks/water courses/drainage lines. Reasonable measures shall be implemented to limit contaminated surface run-off into the surrounding vegetation.

SDEM 4.4.15 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.

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.

SDEM 4.4.16 Community relations (Subclause 4.3.18)

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

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.

Information on the project shall be provided to local people, such as through a poster at the entrance to the site.

SDEM 4.4.17 Erosion and sedimentation control (Subclause 4.3.19)

Erosion control measures shall be implemented to minimise erosion at excavation / clearing sites or aggregate storage sites. 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.

The proposed project shall be located away from the no-go areas, including a 30 m buffer area around these no-go areas. Earth moving construction activities shall take place in the dry season as far as possible.

Perennial alien species such as *P. glandulosa* shall be removed from sites disturbed or cleared by construction activities.

SDEM 4.4.18 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.

SDEM 4.4.19 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 for employment opportunities.

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.

SDEMA 5 COMPLIANCE WITH REQUIREMENTS AND PENALTIES

SDEM 5.1 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

This section contains the Operational Framework EMP table which constitutes the Operational Framework EMP. It is important to note that this Framework OEMP 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.

This section contains the Operational Framework EMP table which constitutes the Operational Framework EMP. It is important to note that this Framework OEMP 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.

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.

5.1 Specification Data: Environmental Management (SDEMA)

	Operational Framework Environmental Management Programme Table						
No	**ASPECT**	**IMPACT**	**MITIGATION MEASURE: (objective and mechanism)**	**PERFORMANCE INDICATOR**	**RESPONSIBILITY**	**SCHEDULE**	**VERIFICATION**
1.	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 wind energy facility 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 Plan 8 and the authorities	ECO and Mulilo	Twice in the 1st three years and then once every five years	ECO and Mulilo
2.	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 Mulilo	During Operational Phase (full lifetime) when the need arise to employ people.	DEA Mulilo
3.	Protection of fauna, flora and avifauna	Constructing a PV facility may have impacts on the	**Objective:** To prevent unnecessary disturbance to natural vegetation.	No animals are injured. No employees enter	ECO, Contractor	During the construction phase (from site	ECO

		vegetation. The site will be cleared of all vegetation and this area could become prone to alien species.	**Mechanism:** 1) A rehabilitation plan for the site should be compiled with the aid of a rehabilitation specialist and adhered to; 2) Shallow depressions and well defined pans (see Fig. 2.2) should be avoided, with buffer zones of at least 50 m around pans; 3) Remove perennial alien species such as P. glandulosa at sites disturbed or cleared, or where panel washing occurs. These should be disposed of in an appropriate manner to prevent future re-infestation and / or spreading of alien vegetation; 4) The small ground level openings in the electrical fence, 20-30 cm in height, should be kept clear to allow for small mammals and reptiles to move through the site 5) Minimize noise and disturbance associated with maintenance activities at the plant once it becomes operational; 6) Use bird-safe structures (ideally with critical air gaps greater than 2 m) for above-ground power lines that exclude birds physically from high risk areas of live infrastructure and comprehensively insulate such areas to avoid bird electrocution; 7) New aboveground lines should be fitted with bird flight diverters and marked along their entire length. Recommendations from bird monitoring could indicate high risk areas to remain marked in the future; and 8) Instituting a comprehensive impact monitoring scheme, and using the results of this scheme to inform and refine a dynamic approach to mitigation.	the no-go areas. No alien vegetation establishment. Invasive alien vegetation monitoring programme implemented.		establishment to contract completion).	
4.	Stormwater runoff, erosion, and pollution of surface water and	Contamination of stormwater runoff can impact on the	**Objective:** Prevent stormwater from eroding the land and becoming contaminated.	Stormwater not contaminated by construction	ECO and contractor	After site clearing has taken place up to the end of the	ECO

	groundwater resources.	surface and groundwater resources. The mismanagement of stormwater can furthermore result in erosion.	**Mechanism:** 1) Monitor both soil chemistry and erosion and mitigate if required; 2) Implement erosion control measures should there be evidence or erosion; 3) Should soil chemistry be affected (this is likely to be an increase in salinity), the nature of the washing mixture could be changed, or acceptable waste treatment employed; 4) Channel runoff should be diverted in such a way as to minimise erosion and if necessary, soil stabilising techniques should be implemented in vulnerable areas; 5) Monitoring in accordance with an environmental management plan as operation proceeds; 6) Remove perennial alien species such as P. glandulosa at sites disturbed or cleared, or where panel washing occurs; 7) Install composting toilets that does not require water, septic tanks or soak-aways; 8) Stormwater channels and "mitre" chutes should be constructed to direct the stormwater flows and minimize and control erosion. Each catchment covered by the site should have a separate drainage system and associated detention pond; 9) Gravel roads should be graded and shaped with a 2 % crossfall back into the slope, allowing stormwater to be channelled in a controlled manor towards the natural drainage lines; 10) Where roads intersect natural, defined	activities. Stormwater control measures are effective at regulating runoff from the site and erosion channels do not develop. Freshwater ecosystems are not unduly disturbed by construction activities within the drainage channels.	ECO to inspect soils for erosion at regular intervals.	construction phase.	

			drainage lines, suitably sized pipe culverts or drive through causeways should be installed or constructed; 11) The minor storm design period should be used to determine the size of the earth channels. A return period of 1:5 years is applicable which approximates to an average intensity of 29 mm/hour; and 12) The major storm occurrence (i.e. 1:25 year, 1:50 year & 1:100 year) should be used to calculate culverts in defined drainage lines and determine flood levels where necessary. The intensities for each occurrence are: 1:25 year – 45 mm/hour, 1:50 year – 52 mm/hour and 1:100 year – 60 mm/hour respectively.				
5.	Visual impact	The proposed site is visible to the public and a construction site might have a negative visual impact on the sense of place.	**Objective:** To protect the sense of place. **Mechanism:** 1) All excess material shall be removed off-site, and the ground shall be returned to original levels / gradients as far as possible; 2) New structures should be placed where they are least visible to the greatest numbers of people, in places where the topography can offer shielding, where possible; 3) Non-reflective colours and materials that would blend in with the natural environment should be used for all buildings. E.g. cladding with local stone or plaster and paint with earthy tones for paint colours, roofs should be grey and non-reflective and doors and window frames should reference either the roof or wall colours; and 4) Finishing materials of the infrastructure (including support structures) should be of colours that are	No complaints from the public.	ECO, Engineer and Contractor	During the construction phase (from site establishment to contract completion).	ECO

			non-reflective and in dark matte colours such as dark grey or charcoal.				
6.	Impacts on local economy (employment) and social conditions	The activity might impact on the economy (local shops, restaurants, and Guest Houses, etc.)	**Objective:** To ensure on-going sustainability of the local tourism / hospitality industry. **Mechanism:** 1) Give preference to local communities for employment opportunities; and 2) Base recruitment on sound labour practices and with gender equality in mind.	Contribute to local community upliftment	Contractor, ECO, Engineer	During the construction phase (from site establishment to contract completion).	ECO
7.	Land use	Based on the distance to the nearest Square Kilometre Array (SKA) station the proposed development could potentially impact on the SKA project.	**Objective:** To prevent electromagnetic interference generated from the power generation equipmentand prevent the facility from acting as secondary transmitters. **Mechanism:** 1) Implement measures recommended in the modelling study, as agreed to with SKA	No interference with the SKA project.	Engineer	During the construction phase (from site establishment to contract completion).	ECO

6 MONITORING PROGRAMMES

6.1 Avifaunal Monitoring Programme

A suitable qualified avifaunal specialist shall be appointed to develop a monitoring programme that meets the requirements of the avifaunal specialist study undertaken as part of the EIA phase for this project. This programme shall be included in this section and considered to be part of the LEMP.

7 DECOMMISSIONING

The Power Purchase Agreement for the Klipgats Pan PV plant is only valid for a period of 20 years after which the plant would most likely be decommissioned and the site rehabilitated. Should the PV plant be decommissioned, materials and infrastructure that could not be recycled would need to be disposed of at an approved landfill site. Infrastructure should be removed and disturbed areas rehabilitated in accordance to the specifications of a suitably qualified rehabilitation specialist during decommissioning.

Since the proposed PV plant comprises of inert materials (mostly concrete), the residual risks associated with decommissioning would be negligible. Should the need arise to decommission the PV plant a decision would need to be made as to whether the infrastructure would be removed or left *in situ*. Roads which are no longer required after decommissioning should be scarified and the areas rehabilitated with the assistance of a rehabilitation specialist.

Materials will be recycled where appropriate, and any hazardous substances shall be removed and disposed of in terms of the requirements of the relevant legislation (e.g. Hazardous Substances Act, No. 15 of 1973) and SANS specifications.

8 ROLES AND RESPONSIBILITIES

Prior to the commencement of construction and operation of the project a suitably qualified and experienced 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.

8.1 Client

Mulilo 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 Environmental Control Officer (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 the Department of Environmental Affairs (DEA) and the Contractor.

8.2 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 Mulilo; and
- Support the ECO in his/her roles and responsibilities.

The duties of the Project Manager during the 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.

8.3 ECO

The ECO shall:

- Oversee and monitor compliance with and implementation of the construction phase EMP, Operational Phase EMP and Rehabilitation Plan, including compliance with the relevant conditions contained in the EA.

The duties of the ECO during construction phase will include:

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; and
ix) Recording and reporting of environmental incidents.

9 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 EIAR 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

CURRICULUM VITAE

Name of Firm	**:**	Aurecon (Pty) Ltd	**Name of Staff**	**:**	Louise Corbett
Profession	**:**	Environmental Practitioner	**Year of Birth**	**:**	1981
Years with Firm	**:**	4	**Nationality**	**:**	South African

Membership in Professional Societies: Treasurer of the South African affiliate of the International Association for Impact Assessment, (IAIAsa)

Key Qualifications:

Ms Corbett, an Environmental Practitioner in the Cape Town office has a Bachelors of Science (Hons) degree in Environmental and Geographical Science, specialising in Environmental Management, from the University of Cape Town. Louise has over five years experience in the environmental field and has compiled and managed numerous environmental investigations including Environmental Impact Assessments, Environmental Management Plans and Environmental Management Programmes. Louise is the treasurer of the South African affiliate of the International Association for Impact Assessment (Western Cape Branch) and is a registered Professional Natural Scientist.

Experience Record:

1a) Regulatory Processes and Environmental Impact Assessment: *Impact Assessment:*

2011-present	**Proposed Wind Energy Facility near Koekenaap, Western Cape**	Project Manager
2011-present	**Proposed Reverse Osmosis Plant at Hendrina Power Station, Mpumalanga**	Project Manager
2010 - present	**Proposed Wind Energy Facility near Komsberg, Western Cape**	Project Manager
2010 - present	**Proposed Wind Energy Facility near Copperton, Northern Cape**	Project Manager
2010 - present	**Proposed Hydropower Station on the Orange River near Kakamas, Northern Cape**	Project Manager
2010 - present	**Proposed Brine and Groundwater Treatment Works at Tutuka Power Station, Mpumalanga**	Project Manager
2010 - present	**Proposed Stormwater System Rehabilitation at Zevenwacht, Western Cape**	Project Manager
2010-2011	**Proposed Expansion of the Piketberg Wastewater Treatment Works, Piketberg, Western Cape**	Project Manager
2010	**Proposed coal mine expansion near Tete, Mozambique**	Project Staff
2009	**Proposed wind monitoring masts in Middelburg, Eastern Cape**	Project Staff
2009	**Proposed wind monitoring masts in De Aar, Northern Cape**	Project Staff
2009	**Proposed wind monitoring masts in Cookhouse, Eastern Cape Eastern**	Project Staff
2008-present	**Proposed Fisantekraal New Town Development**	Project Staff

2008	**Proposed Langefontein Windfarm, West Coast**	Project Staff
2008-present	**Proposed Coal-Fired Power Station in the Waterberg, Limpopo**	Project Staff and Manager
2008	**Proposed Subdivision of Farm Palmiet River No. 319, Elgin**	Project Staff
2008	**Proposed Sedgefield Off-Channel Dam, Sedgefield**	Project Staff
2007-2008	**Proposed Plant Extraction Facility in the Paarl Industrial Area, Paarl**	Project Staff
2007	**Proposed upgrade of fuel pipelines at the Cape Town International Airport.**	Project Manager
2006-2007	**Proposed rezoning of public open space (portion of Erf 10565) in Boston.**	Project Manager
2006-2007	**Proposed upgrade of N1 intersections near De Doorns.**	Project Manager
2006-2007	**Proposed development of the Ibhubesi Gas Field and associated infrastructure, West Coast, South Africa.**	Project Staff
2006-2007	**Proposed new regional landfill to service the City of Cape Town.**	Project Staff
2006-2007	**Proposed subdivision and rezoning of Erf 1366, Eerste River.**	Project Manager
2006-2007	**Proposed subdivision and rezoning of Erf 23300, Maitland (Royal Maitland Phase 3).**	Project Manager
2006-2007	**Proposed subdivision and rezoning of Erf 3410, Simon's Town.**	Project Manager
2006-2007	**Proposed subdivision and rezoning of Erf 1, Simon's Town.**	Project Manager
2006-2007	**Proposed Rocklands Eco Estate.**	Project Manager
2006-2007	**Proposed upgrade of facilities at the River Club, Observatory.**	Project Manager

1b) Regulatory Processes and Environmental Impact Assessment: ***Mining and Oil and Gas Prospecting Applications:***

2007	**Proposed deepwater geophysical survey of the South African Continental Margin.**	Project Manager
2007	**Proposed 2D seismic survey in the Northern Block, offshore Namibia.**	Project Manager
2007	**Proposed borrow pits for the upgrade of road sections in the Central Karoo District.**	Project Manager

2006-2007	**Proposed borrow pits for the upgrade of road sections in the Overberg District.**	Project Staff
2006	**Proposed geotechnical survey in the Southern and Northern Blocks offshore Namibia.**	Project Manager
2006	**Proposed reseal of Trunk road 44/1, Main roads 401, 404, 368 and the upgrade of Divisional road 1834 and the development of an associated borrow pit near Uniondale.**	Project Manager

2) Environmental Management Plans:

2010	**Construction Environmental Management Plan for Stellenbosch Dams Rehabilitation**	Project Manager
2006	**Construction Environmental Management Plan for Sitari Fields Golf Estate, Firgrove/ Macassar.**	Project Staff

3) Institutional and Policy Development and Professional Review Services:

2007-2008	**Department of Economic Affairs Environment and Tourism Decision-making Support.**	Project Staff

4) Other:

2011	**Environmental Input to a Potential Hydropower Station on the Orange River, Northern Cape**	Project Manager
2008	**Environmental Input to Sites for a Solar Cell Factory**	Project Staff
2008	**Environmental Sensitivity Study for the Proposed Fisantekraal New Town Development, Western Cape**	Project Staff
2006	**Exemption application for tow surfing in the Table Mountain Marine Protected Area**	Project Staff

Countries of Work Experience: South Africa, United Kingdom, Canada, Mozambique

Education:
-BSc (Hons) Environmental Management, University of Cape Town, 2004.
-BSc Environmental & Geographical Science, University of Cape Town, 2003.

Employment Record:

2009 - present	Senior Environmental Practitioner, Aurecon (Pty) Ltd
2007- 2009	Environmental Practitioner, Ninham Shand (Pty) Ltd
2006-2007	Environmental Consultant, CCA Environmental (Pty) Ltd
2005- 2005	Systems Administrator, Morrison's Plc, London UK
2004- 2005	Customer Services Advisor, Barclays Bank Plc, London UK
2003-2004	Fairmont Gold Attendant, Fairmont Chateau Whistler, Whistler Canada
2003-2003	Practical Demonstrator to undergraduate Environmental and Geographical Science students, University of Cape Town

Languages: English (first), Afrikaans

Curriculum vitae: Ms FI GRESSE

Name	:	**GRESSE, FRANCIENA ISABELLA**
Date of Birth	:	14 March 1985
Profession/Specialisation	:	Environmental Practitioner
Years with Firm	:	3
Nationality	:	South African
Years experience	:	3

Key qualifications

Ms Gresse is an Environmental Practitioner in the Cape Town office. She completed a Bachelor of Science and an Honours Degree in Conservation Ecology at the University of Stellenbosch. She has been involved in various projects, including a 24G application, environmental impact assessments, renewable energy projects, environmental management plans, environmental control officer (ECO) work, pre-feasibility and feasibility studies for the Western Cape Water Supply System and a catchment management strategy for the Olifants-Doorn catchment, Western Cape.

Employment record

03/2009 - Date	Aurecon, (previously Africon, Ninham Shand and Connell Wagner), Environmental Practitioner
2008 - 02/2009	Ninham Shand, Candidate Environmental Consultant

Experience record

***Proposed Rehabilitation of Wetlands as Part of the Working for Wetlands (Western and Northern Cape, South Africa)* 2010 – Date.** *Project Staff.* Appointed by the South African National Biodiversity Institute (SANBI) to conduct environmental impact assessments for the rehabilitation of specific wetlands in all provinces of South Africa over a five year period. She was responsible for the compilation of Basic Assessment Reports and Wetland Rehabilitation Plans for the Western Cape as well as the Northern Cape. Other responsibilities includes liaison with authorities, public participation process, management of specialists and general project management. (SANBI)

***Environmental Impact Assessment for the Proposed Extension of the Ash Dam Facility at Kriel Power Station* (Mpumalanga, South Africa) 2010 – Date.** *Project Staff*. Appointed by Eskom to conduct an environmental impact assessment for the proposed construction of a fourth ash dam facility at the Kriel power station. She was involved in the screening process, compiling the scoping and EIA reports and public participation. In conjunction, she was also involved in the compilation of a Waste Management Licence application required for the proposed ash dam. (Eskom)

***Environmental Impact Assessment for Proposed Solar Energy Facility, Onder Rietvlei Farm (Portion 3 of Farm 18, Aurora, West Coast, South Africa)* 2010 – 2011.** *Project Staff.* Appointed by Solaire Direct to undertake a basic environmental impact assessment process for the proposed construction of a 10 MW solar energy facility. Responsible for the compilation of the draft and final reports, public participation process, management of specialists and general project management. (Solaire Direct Southern Africa)

***Environmental Sensitivity Study for a Proposed Solar Energy Facility on a Farm Near Aurora (West Coast, South Africa)* 2010.** *Project Staff.* Appointed to provide and environmental sensitivity study (ESS) which inter alia highlights the potential constraints ("red flags") and opportunities presented by the site from an environmental perspective. Responsible for the compilation of the ESS. (Solaire Direct Southern Africa)

***Proposed Remediation, Rehabilitation and Restoration of the Spruit, Krom, Leeu and Palmiet Rivers* (Wellington and Paarl, South Africa) 2009 – 2010.** *Project Staff.* Appointed by the Drakenstein Municpality to undertake the requisite EIA process for the rehabilitation, remediation and stabilisation of four rivers within Paarl and Wellington. Responsible for the EIA and public participation processes. (Drakenstein Municipality)

***Proposed Construction of a New Pipeline from Bovlei Winery to Withoogte Dam* (Wellington, South Africa) 2009 – 2011.** *Project Staff.* The Drakenstein Municipality propose to replace a section of the existing pipeline extending from the Withoogte Dam to the Welvanpas Reservoir near Wellington as part of

the municipality's water master plan in order to improve the overall water supply. Responsible for the compilation of the EIA report, management of specialists and the public participation process. (Drakenstein Municipality)

Proposed Erection of Eskom Communication Sirens/PA Systems **(Blaauwberg, South Africa) 2009 – 2010.** *Project Staff.* Appointed by Eskom to conduct three EIA processes for the (a) erection of 10 new sirens in the Parklands area, (2) relocation of one siren in Bloubergstrand and (3) upgrade of five sirens on farms near Melkbosstrand. Responsible for compilation of EIA reports and the public participation process. (Eskom)

Overberg District Municipality: Integrated Transport Plan: Strategic environmental informants **(South Africa) 2009.** *Project Staff.* Aurecon's Transportation Unit was appointed to revise the integrated transport plan. The Environmental Unit was sub-contracted to provide environmental input. Responsible for identifying and describing the relevant informants. (Overberg District Municipality).

Annandale Commercial: Development of Petrol Filling Station on Portion of Erf 5561 **(Kuils River, South Africa) 2009.** *Project Staff.* Appointed to compile a construction environmental management plan (CEMP) for the construction of a filling station on the corner of Gladioli Street and Amandel Drive, Kuils River. Responsible for the compilation of the project specification document as part of the CEMP. (Communicate)

Pre-feasibility and Feasibility Studies for Augmentation of the Western Cape Water Supply System **(South Africa) 2008 – Date.** *Project Staff.* The Department of Water Affairs commissioned the pre-feasibility and feasibility studies for the augmentation of the Western Cape Water Supply system through the further development of the surface water resources. Surface water schemes to be investigated, were identified by the Western Cape Water Supply system: Reconciliation strategy study. Responsible for the public participation process, management of environmental specialists and the compilation of a socio-economic overview of the study area.

C.A.P.E. Olifants-Doring Catchment Management Agency Project: Development of a catchment management strategy water resource protection sub-strategy for the Olifants-Doring Catchment **(South Africa) 2008 – 2009.** *Project Staff.* Appointed by CapeNature to compile a catchment management strategy water resource protection sub-strategy for the Olifants-Doorn catchment. Responsible for the compilation of a database that lists all institutions and their respective mandates in terms of water resource protection and biodiversity conservation decision-making for the Olifants-Doring catchment, workshop arrangements and general project related work.

Table Mountain Group Aquifer Feasibility Study and Pilot Project **(Western Cape, South Africa) 2008 - 2010.** *Environmental Control Officer.* The City of Cape Town initiated a study into the Table Mountain Group Aquifer as a potential water source to augment the city's supply. The feasibility and pilot project phase Record of Decision (RoD) required completion for site-specific Environmental Management Plans (EMPs) for drilling sites that were assessed to be environmentally sensitive. Site-specific EMPs were designed for sensitive sites to ensure minimal environmental impact during the drilling phase. Responsible for monitoring compliance with the RoD and EMP during the drilling phase. (City of Cape Town).

Water Reconciliation Strategy for the Algoa Water Supply Area **(Eastern Cape, South Africa) 2008 - 2009.** *Project Staff.* This project provided an assessment of the environmental opportunities and constraints for a suite of water schemes in the Algoa water supply area. This was undertaken as part of a broader study in the area.

Proposed Extension of Lock Road **(Kalk Bay, South Africa) 2008 - 2009.** *Project Staff.* The project comprised an Environmental Impact Assessment (EIA) process for extending Lock Road to an existing erf. Responsible for being involved during the final stages of the application. (Mr Rick Bartlett).

Proposed Development of Apple and Pear Orchards on Soetmelksvlei Farm **(Riviersonderend, South Africa) 2008 - 2009.** *Project Staff.* This Agri-development project involved the development of 50ha of apple and pear orchards in the Riviersonderend region. Responsible for compiling the basic assessment report, Environmental Management Plan (EMP), and managing the specialists and public participation process. (BETCO).

Application for Rectification in Terms of Section 24G of NEMA for the Unlawful Commencement of a Fruit Processing Factory on Farm Op De Tradouw, Number 69 **(Barrydale) 2008 - 2009.** *Project Staff.* The project consisted of an application for rectification in terms of Section 24G of NEMA. Responsible for

compiling an environmental impact report and an Environmental Management Plan (EMP) for the application, as well as managing the public participation process. (Schoonies Family Trust).

Proposed redevelopment of the Blaauwberg Conservation Area: Eerstesteen Node **(South Africa) 2008 - 2010.** The project entailed an Environmental Impact Assessment (EIA) process for redeveloping the Eerstesteen Conservation Area on the West Coast. Responsible for compiling the EIA report, as well as managing specialists and the public participation process. (City of Cape Town).

Environmental Sensitivity Study for the Proposed Dasdrif Poultry Farm **(Moorreesburg, South Africa) 2008.** *Project Staff.* Appointed to provide and environmental sensitivity study (ESS) which inter alia highlights the potential constraints ("red flags") and opportunities presented by the site from an environmental perspective. Responsible for the compilation of the ESS. (Eikenhoff Poultry Farms (Pty) Ltd).

Department of Economic Affairs, Environment and Tourism (DEAET) decision-making support **(South Africa) 2008.** *Project Staff.* Responsible for assisting DEAET with the review and processing of Environmental Impact Assessment (EIA) applications in terms of the Environment Conservation Act.

Joint Maputo River Basin water resources study **(Mozambique, Swaziland and South Africa) 2008.** *Project Staff.* The project provided an environmental opportunities and constraints assessment of a suite of potential dams in South Africa and Swaziland, within the Maputo River Catchment. This was undertaken as part of a broader study into the catchment.

Education

2007 : BSc (Hons) Conservation Ecology, University of Stellenbosch, South Africa

Professional affiliations

Member, International Association of Impact Assessment (IAIA)

Languages

	Reading	**Writing**	**Speaking**
English	Excellent	Excellent	Excellent
Afrikaans	Excellent	Excellent	Excellent

By my signature below I certify the correctness of the information above and my availability to undertake this assignment.

_____ _____

Signature of Staff Member Date

APPENDIX B

CONSTRUCTION EMP GENERAL SPECIFICATIONS (COMPREHENSIVE)

SPECIFICATION EM : ENVIRONMENTAL MANAGEMENT (COMPREHENSIVE)

CONTENTS

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SPECIFICATION EM : ENVIRONMENTAL MANAGEMENT (COMPREHENSIVE)

1. SCOPE

This Specification covers the requirements for controlling the impact of construction activities on the environment. It contains clauses that are generally applicable to the undertaking of civil engineering works in areas where it is necessary to impose pro-active controls on the extent to which the construction activities impact on the environment.

Interpretations and variations of this Specification are set out in the Specification Data.

2. NORMATIVE REFERENCES

2.1 Supporting specifications

Where this Specification is required for a project the following specifications shall, inter alia, form part of the Contract Document.

a) Specification Data;
b) SANS 1200 Series of Standardized Specifications;
   i) SANS 1200 A or SANS 1200 AA, as applicable;
c) Specification AO,
d) Construction Regulations, 2003, and
e) Standards listed in Appendix A. [1]

3. DEFINITIONS

For the purposes of this Specification the definitions and abbreviations given in the applicable specifications listed in 2.1 and the following definitions shall apply:

Environment : The surroundings within which humans exist and that are made up of:
   i) the land, water and atmosphere of the earth;
   ii) micro-organisms, plant and animal life;
   iii) any part or combination of (i) and (ii) and the interrelationships among and between them; and
   iv) the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being.

Potentially hazardous Substance : A substance that, in the reasonable opinion of the Engineer, can have a deleterious effect on the environment.

Method Statement : A written submission by the Contractor to the Engineer in response to the Specification or a request by the Engineer, setting out the plant, materials, labour and method the Contractor proposes using to carry out an activity, identified by the relevant specification or the Engineer when requesting the Method Statement, in such detail that the Engineer is enabled to assess whether the Contractor's proposal is in accordance with the Specifications and/or will produce results in accordance with the Specifications.

[1] See Appendix A

The Method Statement shall cover applicable details with regard to:
construction procedures,
materials and equipment to be used,
transportation of equipment/materials to and from site,
movement of equipment/material on site,
storage of materials on site,
containment (or action to be taken if containment is not possible) of leaks or spills of any liquid or material that may occur,
timing and location of activities,
areas of non-compliance with the Specifications, and any other information deemed necessary by the Engineer.

Reasonable : Unless the context indicates otherwise, reasonable in the opinion of the Engineer after he has consulted with a person, not an employee of the Employer, suitably experienced in "environmental implementation plans" and "environmental management plans" (both as defined in Act No 107,1998).

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

Contaminated water : Water contaminated by the Contractor's activities, e.g. concrete water and runoff from plant/ personnel wash areas.

Topmaterial : The top 150 mm of soil (topsoil) and root material of cleared vegetation.

4. REQUIREMENTS

4.1 Materials

4.1.1 Materials handling, use and storage

The Contractor shall ensure that any delivery drivers are informed of all procedures and restrictions (including "no go" areas) required to comply with the Specifications. The Contractor shall ensure that these delivery drivers are supervised during off loading, by someone with an adequate understanding of the requirements of the Specifications.

Materials shall be appropriately secured to ensure safe passage between destinations. Loads including, but not limited to sand, stone chips, fine vegetation, refuse, paper and cement, shall have appropriate cover to prevent them spilling from the vehicle during transit. The Contractor shall be responsible for any clean-up resulting from the failure by his employees or suppliers to properly secure transported materials.

4.1.2 Hazardous substances

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

Petroleum, chemicals, harmful and hazardous waste shall be stored in an enclosed and bunded area. This area shall be subject to the approval of the Engineer. The waste shall be disposed of at a hazardous waste disposal site as approved by the Engineer.

4.1.2.1 Shutter oil and curing compound

Shutter oil and curing compound pose a risk of causing water and soil contamination and accordingly are regarded as potential hazardous substances. The Contractor shall ensure that shutter oil and curing compound containers in use are stored within the fuel bund. The remaining containers shall be inspected regularly to ensure that no leakage occurs. When shutter oil or curing compound is dispensed, the proper dispensing equipment shall be used, and the storage container shall not be tipped in order to dispense the oil/compound. The dispensing mechanism of the shutter oil/curing compound storage container shall be stored in a waterproof container when not in use.

Shutter oil and curing shall be used in moderation and shall be applied under controlled conditions using appropriate equipment. The Contractor shall take all reasonable precautions to prevent accidental and incidental spillage during the application of these compounds.

In the event of a shutter oil or curing compound spill, the source of the spillage shall be isolated, and the spillage contained. The Contractor shall clean up the spill, either by removing the contaminated soil or by the application of absorbent material in the event of a larger spill. Treatment and remediation of the spill area shall be undertaken to the reasonable satisfaction of the Engineer.

4.1.2.2 Bitumen

The Engineer shall be advised of the area that the Contractor intends using for the storage of bitumen drums/ products. The storage area shall have a smooth impermeable (concrete or 250 µm plastic covered in sand) floor. The floor shall be bunded and sloped towards a sump to contain any spillages of substances. The bund shall be inspected and emptied daily, and serviced when necessary. The bund shall be closely monitored during rain events to ensure that it does not overflow.

4.2 Plant

4.2.1 Ablution facilities

The Contractor shall ensure that no spillage occurs when the toilets are cleaned or emptied and that the contents are properly stored and removed from Site. Discharge of waste from toilets into the environment and burial of waste is strictly prohibited.

Washing, whether of the person or of personal effects and acts of excretion and urination are strictly prohibited other than at the facilities provided.

4.2.2 Solid waste management

The Contractor shall provide sufficient bins with lids on Site to store the solid waste produced on a daily basis. Solid, non-hazardous waste shall be disposed of in the bins provided and no on-site burying, dumping or burning of any waste materials, vegetation, litter or refuse shall occur. Bins shall not be allowed to become overfull and shall be emptied a minimum of once daily. The waste may be temporarily stored on Site in a central waste area that is weatherproof and scavenger-proof, and which the Engineer has approved.

All solid waste shall be disposed of off site at an approved landfill site. The Contractor shall supply the Engineer with a certificate of disposal.

4.2.3 Contaminated water

The Contractor shall set up a contaminated water management system, which shall include collection facilities to be used to prevent pollution, as well as suitable methods of disposal of contaminated water. The Contractor shall prevent the discharge of water contaminated with any pollutants, such as soaps, detergent, cements, concrete, lime, chemicals, glues, solvents, paints and fuels, into the environment.

The Contractor shall notify the Engineer immediately of any pollution incidents on Site. The Engineer's approval is required prior to the discharge of contaminated water to the Municipal sewer system.

4.2.4 Site structures

All site establishment components (as well as equipment) shall be positioned to limit visual intrusion on neighbours and the size of area disturbed. The type and colour of roofing and cladding materials to the Contractor's temporary structures shall be selected to reduce reflection.

4.2.5 Noise control

The applicable regulations framed under the Occupational Health and Safety Act, 1993 (Act No. 85 of 1993), and the provisions of SANS 1200 A Subclause 4.1 regarding "built-up areas" shall apply to all areas within audible distance of residents whether in urban, peri-urban or rural areas.

Appropriate directional and intensity settings are to be maintained on all hooters and sirens, and the Contractor shall provide and use suitable and effective silencing devices for pneumatic tools and other plant such that the noise level in inhabited areas and dwellings adjacent to the work areas will not increase by more than 7 dB(A)Leq 60 above residual background sound levels. Similarly in habituated areas adjacent to access roads maximum noise levels shall not exceed 60 dB(A)Leq 60 and maximum sound pressure level of 70 dB(A).

Where excess noise generation is unavoidable, the Contractor shall, by means of barriers, effectively isolate the source of any such noise in order to comply with the said regulations. The Contractor shall restrict any of his operations that may result in undue noise disturbance to those communities and dwellings abutting the Site to the hours of 08:00 to 17:00 on weekdays and Saturdays. No work will be permitted on Sundays unless otherwise agreed to with the Engineer.

No amplified music shall be allowed on Site. The use of radios, tape recorders, compact disc players, television sets etc shall not be permitted unless the volume is kept sufficiently low as to avoid any intrusion on members of the public within range. The Contractor shall not use sound amplification equipment on Site unless in emergency situations.

4.2.6 Lights

The Contractor shall ensure that any lighting installed on the site for his activities does not interfere with road traffic or cause a reasonably avoidable disturbance to the surrounding community or other users of the area.

4.2.7 Fuel (petrol and diesel) and oil

Unless otherwise specified in the Specification Data, fuel may be stored on site in an area approved by the Engineer. The Contractor shall ensure that all liquid fuels (petrol and diesel) are stored in tanks with lids, which are kept firmly shut or in bowsers. The tanks/bowsers shall be situated on a smooth impermeable surface (concrete or 250 µm plastic) with an earth bund (plastic must have a 5 cm layer of sand on top to prevent damage and perishing). The impermeable lining shall extend to the crest of the bund and the volume inside the bund shall be 130% of the total capacity of all the storage tanks/ bowsers. The bunded area shall be covered to protect it from rain. Provision shall be made for refuelling at the fuel storage area, by protecting the soil with 250 µm plastic covered with a minimum of a 5 cm layer of sand.

If fuel is dispensed from 200 litre drums, only empty externally clean drums may be stored on the bare ground. All empty externally dirty drums shall be stored on an area where the ground has been protected. The proper dispensing equipment shall be used, and the drum shall not be tipped in order to dispense fuel. The dispensing mechanism of the fuel storage drum shall be stored in a waterproof container when not in use.

The Contractor shall prevent unauthorised access into the fuel storage area. No smoking shall be allowed within the vicinity of the fuel storage area. The Contractor shall ensure that there is adequate fire-fighting equipment at the fuel stores.

Where reasonably practical, plant shall be refuelled at the fuel storage area or at the workshop as applicable. If it is not reasonably practical then the surface under the refuelling area shall be protected against pollution to the reasonable satisfaction of the Engineer prior to any refuelling activities. The Contractor shall ensure that there is always a supply of absorbent material readily available to absorb/ breakdown and where possible be designed to encapsulate minor hydrocarbon spillage. The quantity of such materials shall be able to handle a minimum of 200 ℓ of hydrocarbon liquid spill. The Contractor shall obtain the Engineer's prior approval for any refuelling or maintenance activities.

4.2.8 Workshop, equipment maintenance and storage

Leaking equipment shall be repaired immediately or removed from the Site. Where practical, all maintenance of equipment and vehicles on Site shall be performed off Site or in the workshop. If it is necessary to do maintenance outside of the workshop area, the Contractor shall obtain the approval of the Engineer prior to commencing activities. The Contractor shall ensure that in his workshop and other plant maintenance facilities, including those areas where, after obtaining the Engineer's approval, the Contractor carries out emergency plant maintenance, there is no contamination of the soil or vegetation. The workshop shall have a smooth impermeable (concrete or 250 µm plastic covered with sand) floor. The floor shall be bunded and sloped towards an oil trap or sump to contain any spillages of substances (e.g. oil).

When servicing equipment on site, drip trays shall be used to collect the waste oil and other lubricants. Drip trays shall also be provided in construction areas for stationary plant (such as compressors) and for "parked" plant (such as scrapers, loaders, vehicles). Drip trays shall be inspected and emptied daily. Drip trays shall be closely monitored during rain events to ensure that they do not overflow. Where practical, the Contractor shall ensure that equipment is covered so that rainwater is excluded from the drip trays.

The washing of equipment shall be restricted to urgent or preventative maintenance requirements only. All washing shall be undertaken off Site or in the workshop. The use of detergents for washing shall be restricted to low phosphate and nitrate containing, low sudsing-type detergents.

4.2.9 Dust

The Contractor shall take all reasonable measures to minimise the generation of dust as a result of construction activities to the satisfaction of the Engineer. The Contractor's dust management planning shall, as a minimum, take cognisance of the following:

- Schedule of spraying water on unpaved roads paying due attention to control of runoff.
- Speed limits for vehicles on unpaved roads and minimisation of haul distances.
- Measures to ensure that material loads are properly covered during transportation.
- Schedule for wheel cleaning and measures to clean up public roads that may be soiled by construction vehicles.
- Minimisation of the areas disturbed at any one time and protection of exposed soil against wind erosion, e.g. by dampening with water or covering with straw
- Location and treatment of material stockpiles taking into consideration prevailing wind directions and location of sensitive receptors.
- Controlled blasting techniques to minimise dust and fly rock during blasting.
- Adherence to the dust loads and protective gear stipulated in the Occupational Health and Safety Act.
- Reporting mechanism and action plan in case of excessive wind and dust conditions.

During summer, a water tanker shall be permanently available for the control of dust generation, and the Contractor shall ensure that the sprays do not generate excess run off. During winter, provision shall be made for a tanker, as required by the Engineer.

During high wind conditions, the Contractor shall comply with the Engineer's instructions regarding dust-damping measures. The Engineer may request the temporary cessation of all construction activities where wind speeds are unacceptably high, and until such time as wind speeds return to acceptable levels.

As required by the Specification Data, the Contractors shall develop and implement a programme for the monitoring of dust fallout in areas where dust generation may be expected.

4.3 Methods and procedures

4.3.1 Method Statements

Any Method Statement required by this Specification, the Specification Data or the Engineer shall be produced within such reasonable time as is required by this Specification, the Specification Data or the Engineer. The Contractor shall not commence the activity until the Method Statement has been approved. Except in the case of emergency activities, the Contractor shall allow a period of two weeks for approval of the Method Statement by the Engineer. Such approval shall not unreasonably be withheld.

Method Statements in respect of environment management that shall be provided by the Contractor within 14 days of receipt of the letter of acceptance and prior to the activity covered by the Method Statement being undertaken, include:

1) Location and structure of the fuel storage site, including the type and volume of storage container and the design and capacity of the bund.

2) Solid waste (refuse) control and removal of waste from the Site, including the number, type and location of rubbish bins, the manner and frequency with which the waste will be removed from site and the disposal site.

3) Contaminated water management system, including an indication of the source and volume of contaminated water and how this would be disposed of.

4) Dust control, including methods to prevent dust generation and methods to reduce dust where its generation is unavoidable.

5) Location and layout of the construction camp in the form of a plan showing offices, stores for fuels and explosives, vehicle parking, access point, equipment cleaning areas and staff toilet placement.

6) Location of proposed site access routes and proposed traffic safety measures.

7) Emergency procedures for fire, and accidental leaks and spillages of hazardous materials.

8) Location, layout and preparation of cement/ concrete batching facilities including the methods employed for the mixing of concrete and the management of runoff water from such areas. An indication shall be given of how concrete spoil will be minimised and cleared.

9) Method of undertaking earthworks, including spoil management, erosion, dust and noise controls.

10) Motivation and method for undertaking any construction related activities within a “no-go” area, including requisite emergency procedures. Unless need clearly motivated and proposed methodology exhibits clear focus on environmentally sensitive construction practice, no activity will be permitted within the defined “no-go” areas.

4.3.2 Environmental awareness training

Within seven days of the Commencement Date, the Contractor's site staff including foremen and site management staff shall attend an environmental awareness training course, of approximately one-hour duration. The Contractor shall liaise with the Engineer prior to the Commencement Date to fix a date and venue for the course. The Contractor shall provide a suitable venue with facilities as required by the Specification Data, and ensure that the specified employees attend the course.

No more than 20 people shall attend each course and the Contractor shall allow for sufficient sessions to train all personnel. Subsequent sessions shall be run for any new personnel coming onto site.

The environmental awareness training course shall be held in the morning during normal working hours. Any new employees coming on to site after the initial training course and the Contractor’s suppliers and subcontractors shall also attend the course. Provision should also be made for quarterly refreshers courses to be undertaken during the course of the Contract. The Contractor shall ensure that all attendees sign an attendance register, and shall provide the Engineer with a copy of the attendance register the day after each course.

4.3.3 Construction personnel information posters

The Contractor shall erect and maintain information posters for the information of his employees depicting actions to be taken to ensure compliance with aspects of the Specifications. Such posters will be supplied by the Engineer and shall be erected at a location specified by the Engineer.

4.3.4 Site clearance

The Contractor shall ensure that the clearance of vegetation is restricted to that required to facilitate the execution of the Works. Site clearance shall occur in a planned manner, and cleared areas shall be stabilised as soon as possible. The detail of vegetation clearing shall be to the Engineer's approval. All cleared vegetation shall either be mulched and mixed into the topsoil stockpiles or disposed of at an approved disposal site. The disposal of vegetation by burying or burning is prohibited without the requisite permit from the local authority.

The Contractor shall strip the Topmaterial within the working areas. The Topmaterial shall be stockpiled separately from subsoil and used for subsequent rehabilitation and revegetation. Topmaterial stockpiles shall not be compacted.

Should fauna be encountered during site clearance, earthworks shall cease until fauna have been safely relocated.

4.3.5 Site division

The Engineer shall be advised of the area that the Contractor intends using for his site establishment. The Contractor's camp shall occupy as small an area as possible, and no site establishment shall be allowed within 50 m of any watercourse unless otherwise approved by the Engineer.

The Contractor shall inform the Engineer of the intended actions and programme for site establishment. The site layout shall be planned to facilitate ready access for deliveries, facilitate future works and to curtail any disturbance or security implications for neighbours.

4.3.6 Site demarcation

As required by the Specification Data, the Contractor shall erect and maintain permanent and/or temporary fences of the type and in the locations directed by the Engineer. Such fences shall, if so specified, be erected before undertaking designated activities.

4.3.7 "No go" areas

If so required by the Specification Data, certain areas shall be considered "no go" areas. The Contractor shall ensure that, insofar as he has the authority, no unauthorised entry, stockpiling, dumping or storage of equipment or materials shall be allowed within the demarcated "no go" areas.

"No go" areas shall be demarcated with fencing consisting of wooden or metal posts at 3 m centres with 1 plain wire strand tensioned horizontally at 900 mm from ground level. Commercially available danger tape shall be wrapped around the wire strand. The Contractor shall maintain the fence for the duration of construction and ensure that the danger tape does not become dislodged.

4.3.8 Protection of natural features

The Contractor shall not deface, paint, damage or mark any natural features (e.g. rock formations) situated in or around the Site for survey or other purposes unless agreed beforehand with the Engineer. Any features affected by the Contractor in contravention of this clause shall be restored/ rehabilitated to the satisfaction of the Engineer.

The Contractor shall not permit his employees to make use of any natural water sources (e.g. springs, streams, open water bodies) for the purposes of swimming, personal washing and the washing of machinery or clothes.

4.3.9 Protection of flora and fauna

Except to the extent necessary for the carrying out of the Works, flora shall not be removed, damaged or disturbed nor shall any vegetation be planted without authorisation.

Trapping, poisoning and/ or shooting of animals is strictly forbidden. No domestic pets or livestock are permitted on Site.

Where the use of herbicides, pesticides and other poisonous substances has been specified, they shall be stored, handled and applied with due regard to their potential harmful effects.

4.3.10 Protection of archaeological and palaeontological remains

The Contractor shall take reasonable precautions to prevent any person from removing or damaging any fossils, coins, articles of value or antiquity and structures and other remains of archaeological interest discovered on the Site, immediately upon discovery thereof and before removal. The Contractor shall inform the Engineer immediately of such a discovery and carry out the Engineers instructions for dealing therewith. All construction within the vicinity of the discovery shall cease immediately and the area shall be cordoned off until such time as the Engineer authorises resumption of construction in writing.

The Engineer will contact the relevant heritage authority.

4.3.11 Access routes/ haul roads

Access to the Construction camp and working areas shall utilise existing roads or tracks. Entry/exit points onto public roads shall take cognisance of traffic safety. Traffic safety measures shall included appropriate signage and signalmen where relevant.

On the Site, and, if so required by the Specification Data, within such distance of the Site as may be stated, the Contractor shall control the movement of all vehicles and plant including that of his suppliers so that they remain on designated routes, are distributed so as not to cause an undue concentration of traffic and that all relevant laws are complied with. In addition such vehicles and plant shall be so routed and operated as to minimise disruption to regular users of the routes not on the Site. On gravel or earth roads on Site and within 500 m of the Site, the vehicles of the Contractor and his suppliers shall not exceed a speed of 20 km/h.

Mud and sand deposited onto public roads by construction activities shall be cleared on a daily basis.

4.3.12 Cement and concrete batching

Where applicable, the location of the batching plant (including the location of cement stores, sand and aggregate stockpiles) shall be as approved by the Engineer. The concrete/cement batching plant shall be kept neat and clean at all times.

No batching activities shall occur directly on unprotected ground. The batching plant shall be located on a smooth impermeable surface (concrete or 250 µm plastic covered with 5 cm of sand). The area shall be bunded and sloped towards a sump to contain spillages of substances. All wastewater resulting from batching of concrete shall be disposed of via the contaminated water management system and shall not be discharged into the environment. Contaminated water storage areas shall not be allowed to overflow and appropriate protection from rain and flooding shall be implemented

Empty cement bags shall be stored in weatherproof containers to prevent wind blown cement dust and water contamination. Empty cement bags shall be disposed of on a regular basis via the solid waste management system, and shall not be used for any other purpose. Unused cement bags shall be stored so as not to be affected by rain or runoff events. In this regard, closed steel containers shall be used for the storage of cement powder and any additives. The Contractor shall ensure that sand, aggregate, cement or additives used during the mixing process are contained and covered to prevent contamination of the surrounding environment.

The Contractor shall take all reasonable measures to prevent the spillage of cement/ concrete during batching and construction operations. During pouring, the soil surface shall be protected using plastic and all visible remains of concrete shall be physically removed on completion of the cement/ concrete pour and appropriately disposed of. All spoiled and excess aggregate/ cement/ concrete shall be removed and disposed of via the solid waste management system.

Where “readymix” concrete is used, the Contractor shall ensure that the delivery vehicles do not wash their chutes directly onto the ground. Any spillage resulting from the “readymix” delivery shall be immediately cleared and disposed of via the solid waste management system.

4.3.13 Earthworks

All earthworks shall be undertaken in such a manner so as to minimise the extent of any impacts caused by such activities, particularly with regards to erosion and dust generation. No equipment associated with earthworks shall be allowed outside of the Site and defined access routes unless expressly permitted by the Engineer.

4.3.14 Pumping

Pumps shall be placed over a drip tray in order to contain fuel spills and leaks. The Contractor shall take all reasonable precautions to prevent spillage during the refuelling of these pumps.

The Contractor shall ensure that none of the water pumped during any dewatering activities, including well points, is released into the environment without the Engineer’s approval. The Engineer’s approval is required prior to the discharge of this water into the Municipal sewer system.

4.3.15 Bitumen

Over spray of bitumen products outside of the road surface and onto roadside vegetation or the surrounding environment shall be prevented using a method approved by the Engineer.

When heating bitumen products, the Contractor shall take cognisance of appropriate fire risk controls. Heating of bitumen products shall only be undertaken using LPG or similar zero emission fuels and appropriate fire fighting equipment shall be readily available.

Stone chip/gravel excess shall not be left on road / paved area verges. This shall be swept / raked into piles and removed to an area approved by the Engineer.

Water quality from runoff from new/ fresh bitumen surfaces will be monitored visually by the Engineer and remedial actions taken where necessary by the Contractor.

4.3.16 Fire control

No fires may be lit on site. Any fires that occur shall be reported to the Engineer immediately. Smoking shall not be permitted in those areas where it is a fire hazard. Such areas shall include the workshop and fuel storage areas and any areas where the vegetation or other material is such as to make liable the rapid spread of an initial flame. In terms of the Atmospheric Pollution Prevention Act (No. 45 of 1965), burning is not permitted as a disposal method.

The Contractor shall ensure that there is basic fire-fighting equipment available on Site at all times. This shall include at least rubber beaters when working in urban open spaces and fynbos areas, and at least one fire extinguisher of the appropriate type when welding or other “hot” activities are undertaken.

4.3.17 Emergency procedures

The Contractor’s procedures for the following emergencies shall include:

i) Fire

The Contractor shall advise the relevant authority of a fire as soon as one starts and shall not wait until he can no longer control it. The Contractor shall ensure that his employees are aware of the procedure to be followed in the event of a fire.

ii) Accidental leaks and spillages

The Contractor shall ensure that his employees are aware of the emergency procedure(s) to be followed for dealing with spills and leaks, which shall include notifying the Engineer and the relevant authorities. The Contractor shall ensure that the necessary materials and equipment for dealing with spills and leaks is available on Site at all times. Treatment and remediation of the spill areas shall be undertaken to the reasonable satisfaction of the Engineer.

In the event of a hydrocarbon spill, the source of the spillage shall be isolated, and the spillage contained. The area shall be cordoned off and secured. The Contractor shall ensure that there is always a supply of absorbent material readily available to absorb/ breakdown and where possible be designed to encapsulate minor hydrocarbon spillage. The quantity of such materials shall be able to handle a minimum of 200 ℓ of hydrocarbon liquid spill.

4.3.18 Community relations

The Contractor shall erect and maintain information boards in the position, quantity, design and dimensions specified. Such boards shall include contact details for complaints by members of the public in accordance with details provided by the Engineer.

The Contractor shall keep a "Complaints Register" on Site. The Register shall contain all contact details of the person who made the complaint, and information regarding the complaint itself.

4.3.19 Erosion and sedimentation control

The Contractor shall take all reasonable measures to limit erosion and sedimentation due to the construction activities. Where erosion and/or sedimentation, whether on or off the Site, occurs despite the Contractor complying with the foregoing, rectification shall be carried out in accordance with details specified by the Engineer. Where erosion and/or sedimentation occur due to the fault of the Contractor, rectification shall be carried out to the reasonable requirements of the Engineer.

Any runnels or erosion channels developed during construction or during the defects liability period shall be backfilled and compacted. Stabilisation of cleared areas to prevent and control erosion shall be actively managed. Consideration and provision shall be made for various methods, namely, brushcut packing, mulch or chip cover, straw stabilising (at a rate of one bale/ 20 m2 and rotovated into the top 100 mm of the completed earthworks), watering, soil binders and anti erosion compounds, mechanical cover or packing structures (e.g. Hessian cover).

Traffic and movement over stabilised areas shall be restricted and controlled, and damage to stabilised area shall be repaired and maintained to the satisfaction of the Engineer.

4.3.20 Aesthetics

The Contractor shall take reasonable measures to ensure that construction activities do not have an unreasonable impact on the aesthetics of the area.

4.3.21 Recreation

If so required by the Specification Data, the Contractor shall take measures to reduce disruption to recreational users of the area abutting the Site.

4.3.22 Access to site

The Contractor shall ensure that access to the Site and associated infrastructure and equipment is off-limits to the public at all times during construction. If so required, as directed by the Engineer, the Contractor shall fence the site to ensure effective control of access to the site. This fence shall be a diamond mesh fence or similar with a minimum height of 1.8 m, and it shall be erected around the site and shall be maintained for the duration of construction.

4.3.23 Crane operations

Drive plants shall be well maintained and drip trays shall be positioned at potential leak areas. Over-greasing of crane cables shall be avoided.

Movement and lifting of hazardous materials shall be undertaken such that they do not cause a pollution, spillage or safety risk (in particular were concrete buckets are in use).

4.3.24 Trenching

Trenching for services shall be undertaken in accordance with the engineering specifications with the following environmental amplifications, where applicable:

a) Soil shall be excavated and used for refilling trenches i.e. soil from the first trench shall be excavated and stockpiled, thereafter soil from the second excavated trench length shall be used to backfill the trench behind it once the services have been laid. The last trench shall be filled using the soil stockpiled from the first trench.

b) Trench lengths shall be kept as short as practically possible before backfilling and compacting.

c) Trenches shall be re-filled to the same level as (or slightly higher to allow for settlement) the surrounding land surface to minimise erosion.

4.3.25 Demolition

Hazardous and non-hazardous materials shall be separated at site and disposed of in a manner approved by the Engineer.

All buildings older than 60 years require a permit from South African Heritage Resources Agency in terms of the National Heritage Resources Act (no. 25 of 1999). A demolition permit is also required from the local authority in terms of the National Building Regulations.

4.3.26 Drilling and jack hammering

The Contractor shall take all reasonable measures to limit dust generation and noise as a result of drilling operations. The Contractor shall ensure that no pollution results from drilling operations, either as a result of oil and fuel drips, or from drilling fluid.

Any areas or structures damaged by the drilling and associated activities shall be rehabilitated by the Contractor to the satisfaction of the Engineer.

4.3.27 Stockpiling

The Engineer will identify suitable sites for stockpiling. Stockpiles shall be convex in shape, shall be no higher than 2 m and shall be located so as to cause minimal disturbance. Stockpiles shall be so placed to occupy minimum width compatible with the natural angel of repose of material, and measures shall be taken to prevent the material from being spread over too wide a surface. Where required, appropriate precautions shall be taken to prevent the erosion and limit the compaction of the stockpiles. The Contractor shall ensure that all stockpiles do not cause the damming of water or run off, or is itself washed away.

Topmaterial stockpiles shall not be covered with any material (e.g. plastic) that may kill seeds or cause it to compost. If the stockpiles start to erode significantly or cause dust problems, they shall be covered with hessian. Where practical, Topmaterial shall not be left for longer than six to eight months before being used for rehabilitation. If stored for longer than six months, the Topmaterial shall be analysed and, if necessary, upgraded before placement.

4.3.28 Site closure and rehabilitation

Any areas that the Engineer believes may have been impacted upon or disturbed, shall be rehabilitated to the satisfaction of the Engineer, which includes all areas where Topmaterial has been stripped. Once construction is complete the Contractor shall clear everything from the Site not forming part of the Permanent Works. The area to be rehabilitated shall first be landscaped to match the topography of the surrounding area as it was prior to construction. The composition of vegetation to be used for any rehabilitation shall be as specified in the Specification Data.

The Contractor may not use herbicides, pesticides, fertilisers or other poisonous substances for the rehabilitation process unless otherwise agreed with the Engineer.

All rehabilitated areas shall be considered "no go" areas and the Contractor shall ensure that none of his staff or equipment enters these areas.

The Contractor shall undertake to remove all alien vegetation re-establishing on the area and shall implement the necessary temporary or permanent measures to combat soil erosion.

4.3.29 Temporary revegetation of the areas disturbed by construction.

Where there is likely to be a delay of greater than two weeks in the landscaping and revegetation of a disturbed area or where that site is likely to be the subject of further construction activities at a later stage, the Contractor shall ensure that the area is temporarily revegetated to combat dust generation and prevent erosion. This revegetation shall occur incrementally immediately upon completion of the construction activities at the subject location.

Prior to revegetation structures and material not forming part of the Permanent Works, including remnants of building materials, concrete foundations, timber and other foreign debris, shall be removed and disposed of via the solid waste management system. The area shall be revegetated as follows:

a) The surface shall be levelled by hand or machine as far as practically possible.
b) Alien vegetation shall be cleared by cutting the plants off at ground level, and painting the stump with 0.5% Garlon in diesel.
c) For areas with a slope of greater than 1:3, straw shall be utilised as a binding material to stabilise the soil during revegetation and rehabilitation of the site. Straw shall consist of natural, dried fibres of hay or chaff of various lengths between 50 mm and 400 mm, delivered to Site in bales and shall be applied evenly by hand or machine at a rate of 1 bale per 20 m2 over the area to be revegetated. It shall then immediately be rotovated into the upper 100 mm layer of soil.
d) The prepared area shall be hydro- or hand-seeded at a rate of 40 kg/ha using Rye grass (Lolium multiflorum). In the event of hand-seeding, the seed mixture as specified shall be mixed with two parts per volume of clean dry plaster sand, then divided in half and applied evenly in two successive applications, one after the other, by means of an approved hand seeding machine (known colloquially as a "tefsaaier"). On completion of the seeding the surface shall be lightly raked to cover the seed with no more than 5 mm of soil.
e) Water used for the irrigation of vegetated areas shall be free of pollutants that will have a detrimental effect on the plants. The vegetated area shall only be watered once, immediately following seeding. Watering should be carried out from a tanker, using a fine nozzle spray to avoid erosion and disturbance of the vegetation. Water for irrigation purposes may not be drawn from any water body.

No construction equipment, vehicles or unauthorised personnel shall be allowed onto areas that have been vegetated. Only persons or equipment required for the preparation of areas, application of fertiliser and maintenance of revegetated area shall be allowed to operate on these areas.

4.3.30 Temporary site closure

If the site is closed for a period exceeding one week, the Contractor, in consultation with the Engineer shall carry out the following checklist procedure.

Hazardous materials stores
Outlet secure/ locked
Bund empty (where applicable)
Fire extinguishers serviced and accessible
Secure area from accidental damage e.g. vehicle collision
Emergency and contact details displayed
Adequate ventilation

Safety
All trenches and manholes secured
Fencing and barriers in place as per the Occupational Health and Safety Act (No 85 of 1193)
Emergency and management contact details displayed
Pipe stockpile wedged/ secured

Erosion
Wind and dust mitigation in place
Slopes and stockpiles at stable angle
Revegetated areas watering schedules and supply secured

Water contamination and pollution
Cement and materials stores secured
Toilets empty and secured
Refuse bins empty and secured
Drip trays empty and secure (where possible)
Structures vulnerable to high winds secure

5. COMPLIANCE WITH REQUIREMENTS AND PENALTIES

5.1 Compliance

Environmental management is concerned not only with the final results of the Contractor's operations to carry out the Works but also with the control of how those operations are carried out. Tolerance with respect to environmental matters applies not only to the finished product but also to the standard of the day-to-day operations required to complete the Works.

It is thus required that the Contractor shall comply with the environmental requirements on an ongoing basis and any failure on his part to do so will entitle the Engineer to certify the imposition of a penalty as detailed below.

5.2 Penalties

Penalties will be issued for certain transgressions. Penalties may be issued per incident at the discretion of the Engineer. Such penalties will be issued in addition to any remedial costs incurred as a result of non-compliance with this Specification. The Engineer will inform the Contractor of the contravention and the amount of the penalty, and shall be entitled to deduct the amount from monies due under the Contract.

Penalties will be as set out in the Specification Data.

5.3 Removal from site and suspension of Works

The Engineer may instruct the Contractor to remove from Site any person(s) who in their opinion is guilty of misconduct, or is incompetent, negligent or constitutes an undesirable presence on Site. Subclause 4.1.9 of this Specification requires that all Plant be in good working order, and accordingly the Engineer may order that any Plant not complying with the Specifications be removed from Site. Where the Engineer deems the Contractor to be in breach of any of the requirements of this Specification, he may order the Contractor to suspend the progress of the Works or any part thereof.

6. Void

7. Void

8. MEASUREMENT AND PAYMENT

8.1 Basic principles

8.1.1 General

Except as specified below, or in the Specification Data or as billed, no separate measurement and payment will be made to cover the costs of complying with the provisions of this Specification and such costs shall be deemed to be covered by the rates tendered for the items in the Bill of Quantities completed by the Contractor when submitting his tender.

8.1.2 All requirements of the environmental management specification

All work not measured elsewhere, associated with complying with any requirement of this Environmental Management specification will be measured and paid as a sum.

The tendered sum shall cover the cost of with complying with the environmental management specification and shall include for all materials, labour and plant required to execute and complete the Works as specified, described in the Bill of Quantities or shown on the Drawing(s).

8.1.3 Work "required by the Specification Data"

Where a clause in this Specification includes a requirement as "required by the Specification Data", measurement and payment for compliance with that requirement shall be in accordance with the relevant measurement and payment clause of the Specification Data.

8.2 Billed items

8.2.1 Method Statements: Additional work

No separate measurement and payment will be made for the provision of Method Statements but, where the Engineer requires a change on the basis of his opinion that the proposal may result in, or carries a greater than warranted risk of damage to the environment in excess of that warranted by the Specifications, then any additional work required, provided it could not reasonably have been foreseen by an experienced contractor, shall be valued in accordance with the Clause in the General Conditions of Contract dealing with Provisional Sums.

A stated sum is provided in the Bill of Quantities to cover payment for such additional work.

8.2.2 All requirements of the environmental management specification

Unit: ..... Sum

All other work not measured elsewhere, associated with complying with any requirement of the environmental management specification shall be measured as a sum.

The tendered rate shall cover any cost associated with complying with the environmental management specification and shall include for all materials, labour and plant required to execute and complete the work as specified, described in the Bill of Quantities or shown on the drawing(s).

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APPENDIX A : APPLICABLE STANDARDS

Reference is made to the latest issues of the following standards:

SANS 1200 A	General
SANS 1200 AA	General (small works)

Specification AOOccupational Health and Safety

Construction Regulations, 2003.