



**ENVIRONMENTAL MANAGEMENT PROGRAMME
(EMPr)**

DEA National File Reference Number:

14/12/16/3/3/2/998

Project Title:

The proposed development of a 225MW solar photovoltaic (PV) facility on several portions of farms in the Hanover district, Emthanjeni local municipality, Pixley Ka Seme district municipality; Northern Cape province.

Prepared for:



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DOCUMENT CONTROL

Table 1: Document Control.

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Justin Bowers	Draft	00		01 August 2017

EXECUTIVE SUMMARY

Soventix South Africa proposes to establish a commercial solar electricity generating facility between the towns of De Aar & Hanover in the Northern Cape province. The solar facility intends to accommodate photovoltaic (PV) components and associated infrastructure comprising of:

- Solar panels arranged in blocks with a total generating capacity of approximately 225 MW_{AC} to be constructed as three separate yet integrated facilities of 75 MW_{AC} each. A total footprint of approximately 170 ha is normally required per 75MW_{AC} facility, totalling approximately 510 ha, but the developer has managed to design the facility to fit comfortably within a 448 ha footprint.
- Each 75 MW_{AC} facility will have an operations building to be contained within a 30 000 m² lay down area for each facility. The facility will include areas used for security management and control room, maintenance as well as changing facilities; and
- An on-site substation with the necessary infrastructure to feed the electricity generated from all three facilities via a loop in loop out into the immediately adjacent 400 kV Eskom network.

This draft Environmental Management Programme (EMPr) is developed in compliance with section 24N of the NEMA, 1998, as amended and contain those requirements prescribed in the EIA Regulations, 2014, as amended, including section 23 and Appendix 4 of GN No. R. 982 of 4 December 2014.

The EMPr is to be read in conjunction with the EIA Report (EIAR) providing detail on the affected environment as well as an impact assessment for the anticipated environmental impacts and the Environmental Authorisation (EA) (once issued).

The developers propose to establish the project on the Remainder of Farm Goedehoop 26 C, Portion 6 of Leuwe Fountain 27 C, Remainder of Farm Riet Fountain 39 C, **Portion 1 of Farm Riet Fountain 39C**, Remainder of Kwanselaars Hoek 40 C, **Portion 1 of Kwanselaars Hoek 40 C**, **Portion 4 of Taaibosch Fontein 41C**, Portion 1 of Farm Kafferspoort 56C, registration district Hanover, Emthanjeni Local Municipality, Pixley Ka Seme District Municipality; Northern Cape Province. The preferred footprint, if accepted by the DEA, will only affect 3 of the 8 properties and portions listed above namely; Portion 1 of Farm Riet Fountain 39C, Portion 1 of Kwanselaars Hoek 40 C & Portion 4 of Taaibosch Fontein 41C.

Activities to be undertaken during the construction, operational and decommissioning phases include:

Construction Phase

- Site preparation;
 - Clearly delineate the construction footprint to avoid construction creep outside the approved development footprint;
 - Search & rescue fauna & flora of conservation concern & protected status ahead of any construction activities;

- Installation of perimeter fencing, during but preferably prior to construction commencement (improved access control and assurance of no construction creep);
- Establish service tracks (access roads pre-existing);
- Transport components and equipment to site;
- Establishment of laydown areas;
- Establishment of ancillary infrastructure;
- Construction of infrastructure foundations;
- Establishment of PV panels;
- Connection of PV panels to the on-site substation;
- Connection of the on-site substation to the grid;
- Site rehabilitation; and
- Environmental management & monitoring throughout the construction process, inclusive of:
 - Continuous monitoring and removal of alien & invasive plant species;
 - Avifauna monitoring and management;
 - Traffic monitoring & management, including dust emissions;
 - Dust monitoring & management, including drilling operations;
 - Storm water monitoring & management;
 - Erosion monitoring and remediation;
 - Fire management;
 - Vegetation & habitat monitoring & management;
 - Hazardous substance monitoring & management, including detecting any leakage or spillage; and
 - Monitoring & management measures to protect hydrological features.

Operational Phase

- Maintenance and repairs of PV and associated equipment inclusive of:
 - Maintenance of roads;
 - Cleaning and maintaining / replacing panels;
 - Maintaining buildings and other infrastructure; and
 - Maintain and repair fencing.
- Environmental management & monitoring throughout the operational process, inclusive of:
 - Continuous monitoring and removal of alien & invasive plant species;
 - Avifauna monitoring and management;
 - Storm water monitoring & management;
 - Erosion monitoring and remediation;
 - Fire management;
 - Vegetation & habitat monitoring & management;
 - Monitoring & management measures to protect hydrological features.
- Waste management; and
- Health and safety implementations.

Post Operational Phase

Two options currently exist for this phase: 1. Should an extension not be granted on the power purchase agreement (PPA), the equipment and infrastructure will be removed and recycled. The site will be fully rehabilitated thereafter. 2. If an extension is granted to the power purchase agreement, consideration would be given to infrastructure upgrade and the deploying of more advance technologies.

1. Decommissioning

Complete decommissioning can occur should it no longer be economically feasible to continue the project or the PPA is not extended. Activities will include:

- Site reparation;
- Disassembly and recycling of existing components; and
- Rehabilitation of the site.

OR:

2. Extension of tenure

Replacement of panels that reached the end of their economic life or replacement with new technology. Activities include:

- Disassembly and replacement of individual panels;
- Repair, maintenance and / or replacement of the framework structures and other required infrastructure; and
- Recycling / disposing of replaced parts.

The implementation of the EMPr within the project is not an optional additional or “add on” requirement. The EMPr is legally binding, integral to the contract and is as important as the engineering aspects of the contract. The EMPr is a working document to be used throughout the life of the project, until such time that closure is achieved.

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CHECKLIST

An environmental management programme (EMPr) must comply with section 24N of the NEMA, 1998, as amended and contain those requirements prescribed in the EIA Regulations, 2014, as amended, including regulation 23 and Appendix 4. Additional requirements relating to content of the EMPr were specified in the departmental communication dated 29/05/2017 as part of the approval of the final Scoping Report. The full suite of requirements are listed in Table 2, which have dictated the layout and content of this EMPr.

Table 2: Environmental Management Programme Checklist.

Content of Environmental Management Programme (EMPr)
1. (1) An EMPr must comply with section 24N of the Act and include-
(a) details of
(i) the EAP who prepared the EMPr; and
(ii) the expertise of that EAP to prepare an EMPr, including a curriculum vitae;
(b) a detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description;
(c) a map at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that any areas that should be avoided, including buffers;
(d) a description of the impact management outcomes, including management statements, identifying the impacts and risks that need to be avoided, managed and mitigated as identified through the environmental impact assessment process for all phases of the development including-
(i) planning and design;
(ii) pre-construction activities;
(iii) construction activities;
(iv) rehabilitation of the environment after construction and where applicable post closure; and
(v) where relevant, operation activities;
(f) a description of proposed impact management actions, identifying the manner in which the impact management outcomes contemplated in paragraph (d) will be achieved, and must, where applicable, include actions to -
(i) avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation;
(ii) comply with any prescribed environmental management standards or practices;
(iii) comply with any applicable provisions of the Act regarding closure, where applicable; and
(iv) comply with any provisions of the Act regarding financial provisions for rehabilitation, where applicable;
(g) the method of monitoring the implementation of the impact management actions contemplated in paragraph (f);

<i>(h) the frequency of monitoring the implementation of the impact management actions contemplated in paragraph (f);</i>
<i>(i) an indication of the persons who will be responsible for the implementation of the impact management actions;</i>
<i>(j) the time periods within which the impact management actions contemplated in paragraph (f) must be implemented;</i>
<i>(k) the mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f);</i>
<i>(l) a program for reporting on compliance, taking into account the requirements as prescribed by the Regulations;</i>
<i>(m) an environmental awareness plan describing the manner in which-</i>
<i>(i) the applicant intends to inform his or her employees of any environmental risk which may result from their work; and</i>
<i>(ii) risks must be dealt with in order to avoid pollution or the degradation of the environment; and</i>
<i>(n) any specific information that may be required by the competent authority.</i>
<i>(2) Where a government notice gazetted by the Minister provides for a generic EMPr, such generic EMPr as indicated in such notice will apply.</i>
<i>The Environmental Management Programme (EMPr) to be submitted as part of the EIAR must include the following:</i>
<i>i. All recommendations and mitigation measures recorded in the EIAR and the specialist studies conducted.</i>
<i>ii. The final site layout map.</i>
<i>iii. Measures as dictated by the final site layout map and micro-siting.</i>
<i>iv. An environmental sensitivity map indicating environmental sensitive areas and features identified during the EIA process.</i>
<i>v. A map combining the final layout map superimposed (overlain) on the environmental sensitivity map.</i>
<i>vi. An alien invasive management plan to be implemented during construction and operation of the facility. The plan must include mitigation measures to reduce the invasion of alien species and ensure that the continuous monitoring and removal of alien species is undertaken.</i>
<i>vii. A plant rescue and protection plan which allows for the maximum transplant of conservation important species from areas to be transformed. This plan must be compiled by a vegetation specialist familiar with the site and be implemented prior to commencement of the construction phase.</i>
<i>viii. An avifauna monitoring and management plan to be implemented during construction and operation of the facility. This plan must be drafted by a suitably qualified avifauna specialist.</i>
<i>ix. A re-vegetation and habitat rehabilitation plan to be implemented during construction and operation of the facility. Restoration must be undertaken as soon as possible after completion of construction activities to reduce the amount of habitat converted at any one time and to</i>

<p><i>speed up the recovery to natural habitats.</i></p>
<p><i>x. An open space management plan to be implemented during the construction and operation of the facility.</i></p>
<p><i>xi. A traffic management plan for the site access roads to ensure that no hazards would result from the increased truck traffic and that traffic flow would not be adversely impacted. This plan must include measures to minimize impacts on local commuters e.g. limiting construction vehicles travelling on public roadways during the morning and late afternoon commute time and avoid using roads through densely populated built-up areas so as not to disturb existing retail and commercial operations.</i></p>
<p><i>xii. A storm water management plan to be implemented during the construction and operation of the facility. The plan must ensure compliance with the applicable regulations and prevent off-site migration of contaminated storm water or increased soil erosion. The plan must include the construction of appropriate design measures that allow surface and subsurface movement of water along drainage lines so as not to impede natural surface and subsurface flows. Drainage measures must promote the dissipation of storm water run-off.</i></p>
<p><i>xiii. A fire management plan to be implemented during the construction and operation of the facility.</i></p>
<p><i>xiv. An erosion management plan for monitoring and rehabilitation erosion events associated with the facility. Appropriate erosion mitigation must form part of this plan to prevent and reduce the risk of any potential erosion.</i></p>
<p><i>xv. An effective monitoring system to detect any leakage or spillage of all hazardous substances during their transportation, handling, use and storage. This must include precautionary measures to limit the possibility of oil and other toxic liquids entering the soil or storm water systems.</i></p>
<p><i>xvi. Measures to protect hydrological features such as streams, rivers, pans, wetlands, dams and their catchments, and other environmental sensitive areas from construction impacts including the direct or indirect spillage of pollutants.</i></p>
<p><i>The EAP must provide detailed motivation if any of the above requirements is not required by the proposed development and not included in the EMP.</i></p>

ABBREVIATIONS / ACRONYMS AND DEFINITIONS

Table 3: List of terms for abbreviations used in this document.

Abbreviation / Acronym	Term
BA	Basic Assessment
CA	Competent Authority
CRE	Chief Resident Engineer
DEA	Department of Environmental Affairs (National)
DENC	Department of Environment and Nature Conservation (Northern Cape)
DMR	Department of Mineral Resources
DWS	Department of Water & Sanitation
EA	Environmental Authorisation
ECO	Environmental Control Officer
EIAr	Environmental Impact Assessment Report
EMPr	Environmental Management Programme
ELM	Emthanjeni Local Municipality
ELU	Existing Lawful Use
EM	Environmental Manager
IEA	Independent Environmental Auditor
GA	General Authorisation
HSO	Health & Safety Officer
I&APs	Interested and Affected Parties
IDP	Integrated Development Plan
LA	Listed Activity (EIA Regulations, 2014)
LN1	Listing Notice 1: GN R. 983, 4 December 2014, as amended
LN2	Listing Notice 2: GN R. 984, 4 December 2014, as amended
LN3	Listing Notice 3: GN R. 985, 4 December 2014, as amended
MPRDA	Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002)
NEMA	National Environmental Management Act, 1998 (Act 107 of 1998)
NERSA	National Energy Regulator of South Africa
NHRA	National Heritage Resources Act, 1999 (Act No. 25 of 1999)
NWA	National Water Act, 1998 (Act No. 36 of 1998)
PDM	Pixley ka Seme District Municipality
PPA	Power Purchase Agreement
REFIT	Renewable Energy Feed-in Tariff

SAHRA	South African Heritage Resources Agency
SDF	Spatial Development Framework
SEO	Site Environmental Officer
WUL	Water Use License

Table 4: Definitions of some terms used in this document.

Term	Source	Definition
Aspect (environmental)	ISO 14001: 2015	<p>Element of an organisation's activities or products or services that interacts or can interact with the environment.</p> <p>An environmental aspect can cause (an) environmental impact(s). A significant environmental aspect is one that has or can have one or more significant environmental impact(s).</p> <p>It is important to note, that the term "Aspect" in the EIA regulations (2014) is undefined, and likely does not carry the same definition as in the ISO standard. The context in which it is used in the Regulations, likely refers to the different components and activities of the applicant.</p>
Development	EIA Regulations (2014)	<p>Means the building, erection, construction or establishment of a facility, structure or infrastructure, including associated earthworks or borrow pits, that is necessary for the undertaking of a listed or specified activity, including any associated post development monitoring, but excludes any modification, alteration or expansion of such a facility, structure or infrastructure, including associated earthworks or borrow pits, and excluding the redevelopment of the same facility in the same location, with the same capacity and footprint.</p>
Environmental Impact	ISO 14001: 2015	<p>Change to the environment, whether adverse or beneficial, wholly or partially resulting an organisation's environmental aspects.</p>
Maintenance	EIA Regulations (2014)	<p>Means actions performed to keep a structure or system functioning or in service on the same location, capacity and footprint.</p>

Performance	ISO 14001: 2015	Measurable unit. Performance can relate either to quantitative or qualitative findings.
Significant impact	EIA Regulations (2014)	Means an impact that may have a notable effect on one or more aspects of the environment or may result in non-compliance with accepted environmental quality standards, thresholds or targets and is determined through rating the positive and negative effects of an impact on the environment based on criteria such as duration, magnitude, intensity and probability of occurrence.

SECTION 1: DETAILS & EXPERTISE OF THE EAP AND APPLICANT

Details of –

(i) The EAP who prepared the report;

Environmental Assessment Practitioner	Ecoleges Environmental Consultants
Contact Person	Justin Aragon Bowers
Postal Address	PO Box 9005, Nelspruit, 1200
Telephone	+27(0)83 644 7179
E-mail	justin@ecoleges.co.za

Project Applicant	Soventix South Africa (Pty) Ltd
Trading Name (if any)	Soventix South Africa
Contact Person	Jean-Paul de Villiers
Physical Address	Unit C-24/25 Olive Grove Industrial Estate Ou Paardevlei Road Somerset West South Africa
Postal Code	7130
Telephone	+27(0)21 852 7333
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Email	Jp.devillers@soventix.com

(i) The expertise of the EAP to prepare the EMP, including a curriculum vitae;

Abbreviated Curriculum Vitae of Justin Aragon Bowers

Name	Justin Bowers
Date of birth / ID No.	15 October 1972 7210155074089
Nationality	South African
Marital Status	Married with four children
Current Address	P O Box 516, Machadodorp, 1170. ● Redwing Farm, erf. Kaalbooi 368JT, Waterval Boven District, 1195, Mpumalanga, South Africa ● Cell: 082 451-5608 ● e-mail: justin@ecoleges.co.za
Languages	English, Afrikaans and Basic Zulu
Driver's Licence	Code EB, A & C1
Specialisations	Key Fields: Compliance monitoring, vegetation ecology, rehabilitation plans, environmental / ecological management plans, environmental auditing, Environmental Impact & Basic Assessment.
Qualifications & Courses Attended	1998 – 2000 NATIONAL DIPLOMA: NATURE CONSERVATION, Technikon Pretoria 2001 – 2002 BACCALAUREUS TECHNOLOGIAE: NATURE CONSERVATION, Technikon Pretoria 2003 – 2007 MAGISTER TECHNOLOGIAE: NATURE CONSERVATION (CUM LAUDE), Tshwane University of Technology, Pretoria 2008 Environmental Law elective (MBA Programme), Rhodes University, Grahamstown. 2010 – Present Certificate in Aquaculture, Department of Genetics & Aquaculture, University of Stellenbosch 2014 Implementing Environmental Management Systems, Centre for Environmental Management, North-West University, Potchefstroom. 2017 Transition ISO 14001 course, Centre for Environmental Management, North-West University, Pretoria locale.
Latest Publication	Sadie J. Ryan, Paul C. Cross, John Winnie, Craig Hay, Justin Bowers, Wayne M. Getz. 2012. The utility of normalized difference vegetation index for predicting African buffalo forage quality. <i>Journal of Wildlife Management</i> DOI: 10.1002/jwmg.407.
Countries worked	South Africa, United Kingdom.
Professional affiliations	IAIA ^{sa} , GSSA, SACNASP.

SECTION 2: INTRODUCTION & BACKGROUND

Photovoltaic (PV) is a method of generating electrical power by converting solar radiation into direct current electricity. A number of solar cells electrically connected to each other and mounted in a support structure or frame is called a photovoltaic module (solar panel). The facility will include areas used for management, security and control room, maintenance and canteen as well as changing facilities. An on-site substation will be required with the necessary infrastructure to feed the electricity generated, via cut and tie-in, into the immediately adjacent 132kv or 400kv Eskom network.

The purpose of the new Solar PV system, includes the establishment of De Aar as a Renewable Energy Hub, which can be achieved by providing different renewable energy options. The aforesaid Hub has to be within close proximity to existing Eskom infrastructure. Locally, the establishment of the proposed project would strengthen the existing electricity grid for the area, providing power in a short space of time (potentially less than two years to commissioning). Should the proposed project be approved it would result in long-term benefits for the De Aar area, e.g. creation of employment and business opportunities.

This EMPr forms part of the feasibility study and prerequisite by National Energy Regulator of South Africa (NERSA) for awarding a Power Purchase Agreement (PPA) under the Renewable Energy Feed in-Tariff (REFIT) program. The REFIT program is also a key project component due to the fact that the next scheduled phase includes Solar PV as an option and the project proponent will take the opportunity to submit the project proposals. The requirement for the successful establishment of a Solar PV plant does include, inter alia, proximity to existing Eskom infrastructure in order to feed electricity into the grid

SECTION 3: DESCRIPTION OF THE ACTIVITY

(b) a detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description.

Table 5 describes all of the activities that will be undertaken during the lifespan of this project including the identified listed activities and associated activities that in their own right do not require environmental authorization, but are needed to achieve the desired objective, that is the supply of renewable energy via:

a 225MW solar photo-voltaic (PV) farm, comprising 3 interconnected 75MW plants, connected to a sub-station that ties into existing ESKOM 400kV overhead power lines.

Table 5. A detailed description of the aspects of the activity that are covered by the EMPr.

Phased activities associated with Solar PV projects
A number of solar cells electrically connected to each other and mounted in a support structure or frame is called a photovoltaic module (solar panel). The facility will include areas used for management, security and control room, maintenance and canteen as well as changing facilities. An on-site substation will be required with the necessary infrastructure to feed the electricity generated, via loop-in and loop-out, into the immediately adjacent 400kv Eskom distribution network.
Planning and Design
Compliance with legal requirements by acquiring authorisations, permits and/or licenses for activities/uses undertaken during construction and operation.
Sustainable resource requirements (water, energy, etc.) for lifespan of project.
Rezoning (Land use): Listed Activity 28 of GN 983, as amended <i>Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture, game farming, equestrian purposes or afforestation on or after 01 April 1998 and where such development:</i> <i>(i) will occur inside an urban area, where the total land to be developed is bigger than 5 hectares; or</i> <i>(ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare.</i>
The current agricultural land-use will be retained for livestock grazing, with the synergistic development of a commercial Solar PV Plant, over a fixed-term.
Layout and design including consideration of alternatives.
Pre-construction
Surveying and Pegging (all footprints from permanent to temporary access roads).
Search & rescue all fauna & flora of conservation importance and protected status
Construction
Site establishment.
Access control including fencing of perimeter.
Human influence (staff conduct, movement).

Construction of permanent and temporary access roads.
Transport on site and accommodation of traffic.
Sourcing & management of water (for drinking, sanitation & construction activities).
Sourcing building sand.
Stockpiling and laydown areas (spoil, mulch, building sand, topsoil, windrows, material & equipment).
Clearing and grading (fence line, operations area, access roads, rack foundations, transformers and inverters, cables, substation and pylons).
Earthworks & excavations (associated with the operations area, road crossings, cabling, transformers and inverters, substation and pylons):
<p>Listed Activity 19 of GN. No. 983, as amended <i>The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse;</i> <i>but excluding where such infilling, depositing, dredging, excavation, removal or moving-</i> <i>(a) will occur behind a development setback;</i> <i>(b) is for maintenance purposes undertaken in accordance with a maintenance management plan;</i> <i>(c) falls within the ambit of activity 21 in this Notice, in which case that activity applies.</i> <i>(d) occurs within existing ports or harbours that will not increase the development footprint of the port or harbour; or</i> <i>(e) where such development is related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies.</i></p>
The Solar PV plant will feed into the existing overhead ESKOM transmission lines that are located within an expansive drainage system, via newly installed pylons.
Drilling and/or ram piling (the rack foundations for the panel mounting hardware and fence poles).
Erection and construction of the panels arrays and associated infrastructure
Feeding or tying the solar PV plant into existing Eskom grid.
Waste management (solid & liquid waste including 'spoil'/handling, separation, storage and disposal).
Hazardous substance (fuel/oil, cement, bitumen, sewage/grey water) management (handling and storage) at sanitation sites, kitchens, & refuelling areas on site.
Plant management (parking, driving, repair and maintenance, and refuelling).
Building work (concrete work).
Disturbing natural areas.
Construction site closure and rehabilitation.
Operation (including maintenance)
Human influence.
Consumption (energy, water, and other resources).
Maintenance.

Lighting to create visibility at night.
Waste management
Terrestrial and aquatic ecological management.
PV panels, which convert the sun's radiation to electrical energy.
<p>Listed Activity 1 of GN. No. 984, as amended <i>The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more, excluding where such development of facilities or infrastructure is for photovoltaic installations and occurs-</i> <i>(a) within an urban area; or</i> <i>(b) on existing infrastructure.</i></p>
The solar PV installation will be a total of 225MW outside an urban area, on a green fields site.
An inverter, which is a key component in matching panels' output to the grid and converts the panels' direct current (DC) electrical output to alternating current (AC).
<p>Listed Activity 9 of GN. No. 984, as amended The development of facilities or infrastructure for the transmission and distribution of electricity with a capacity of 275 kilovolts or more, outside an urban area or industrial complex excluding the development of bypass infrastructure for the transmission and distribution of electricity where such bypass infrastructure is — (a) temporarily required to allow for maintenance of existing infrastructure; (b) 2 kilometres or shorter in length; (c) within an existing transmission line servitude; and (d) will be removed within 18 months of the commencement of development.</p>
The overhead ESKOM lines are 400KVA and the loop-in, loop-out from the sub-station to the ESKOM overhead lines may exceed 2 kilometres in length, depending on which of the two 400KVA ESKOM designates for the tie-in.
Substation
Decommissioning
Disposal of PV panels and other waste.
Human influence (staff conduct, movement)
Roads and access routes
Rehabilitation of affected footprints.

SECTION 4: LAYOUT MAP OF PROPOSED ACTIVITY

(c) a map at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that any areas that should be avoided, including buffers.

Additional maps required from feedback received following the submission of the Final Scoping Report dated 29/05/2017:

The Environmental Management Programme (EMPr) to be submitted as part of the EIAR must include the following:

- ii. The final site layout map.*
- iv. An environmental sensitivity map indicating environmental sensitive areas and features identified during the EIA process.*
- v. A map combining the final layout map superimposed (overlain) on the environmental sensitivity map.*

Figure 1. provides a map of the final site layout of the solar PV arrays and how they fit into the preferred alternative footprint. Figure 2. provides a map of the proposed preferred development footprint in the context of the surrounding environmental sensitivities. Figure 3 combines the information in the two preceding maps to consolidate all the available layers. The preferred footprint development has been through an iterative process, to ensure that it remains outside of all sensitive receptors assessed, including specified buffer zones.

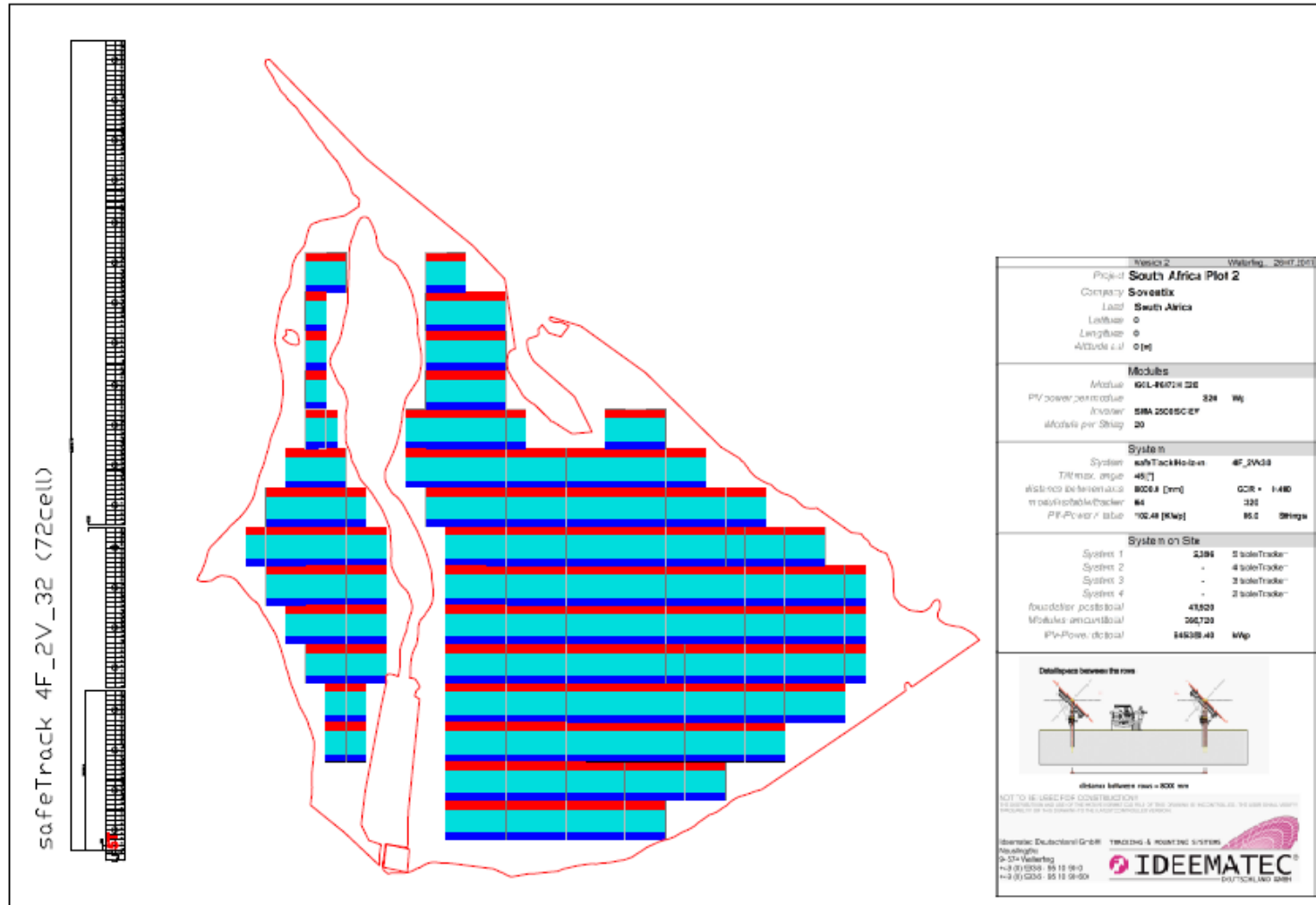


Figure 1. Site layout map.

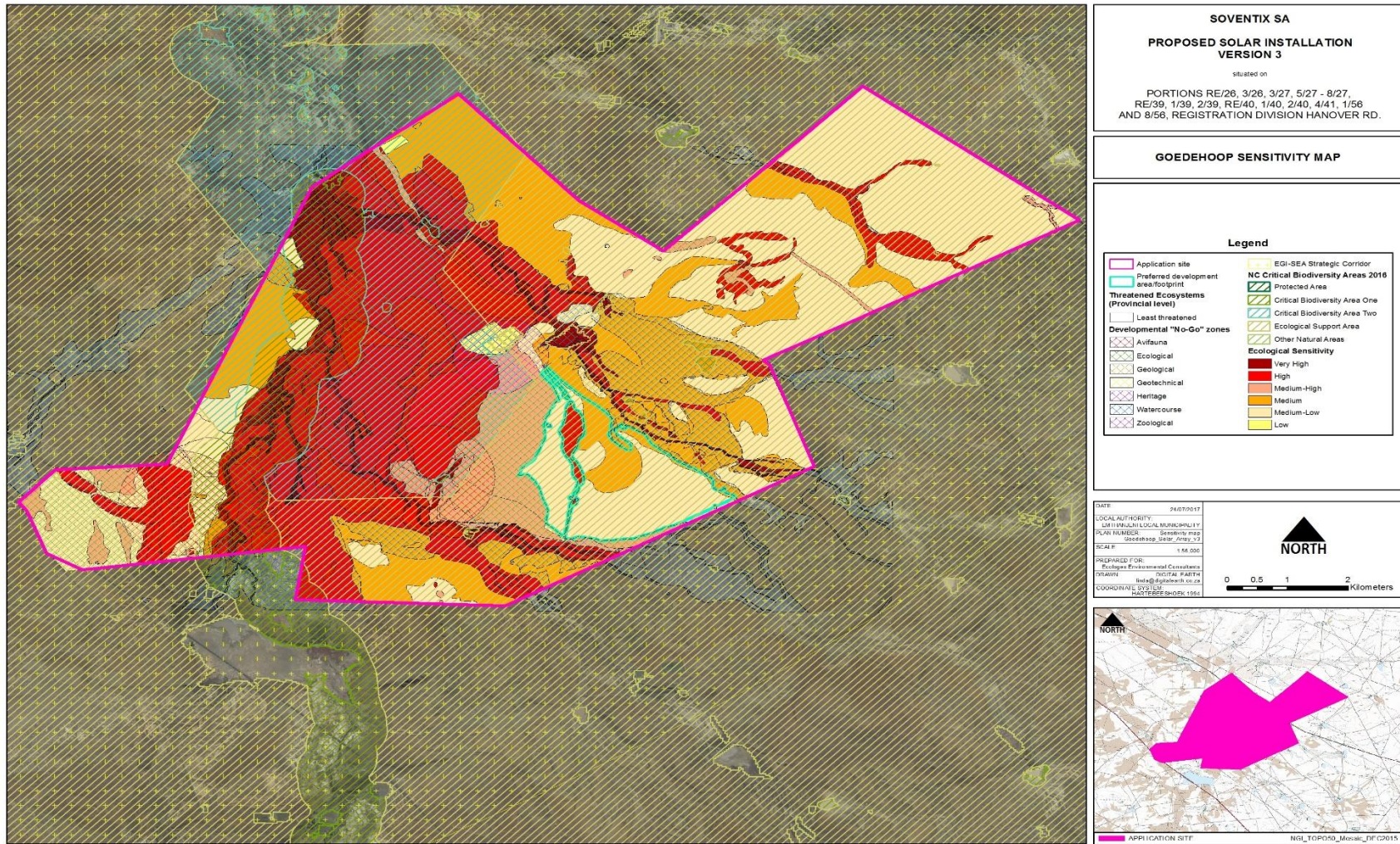


Figure 2. Site sensitivity map including proposed site development footprint.

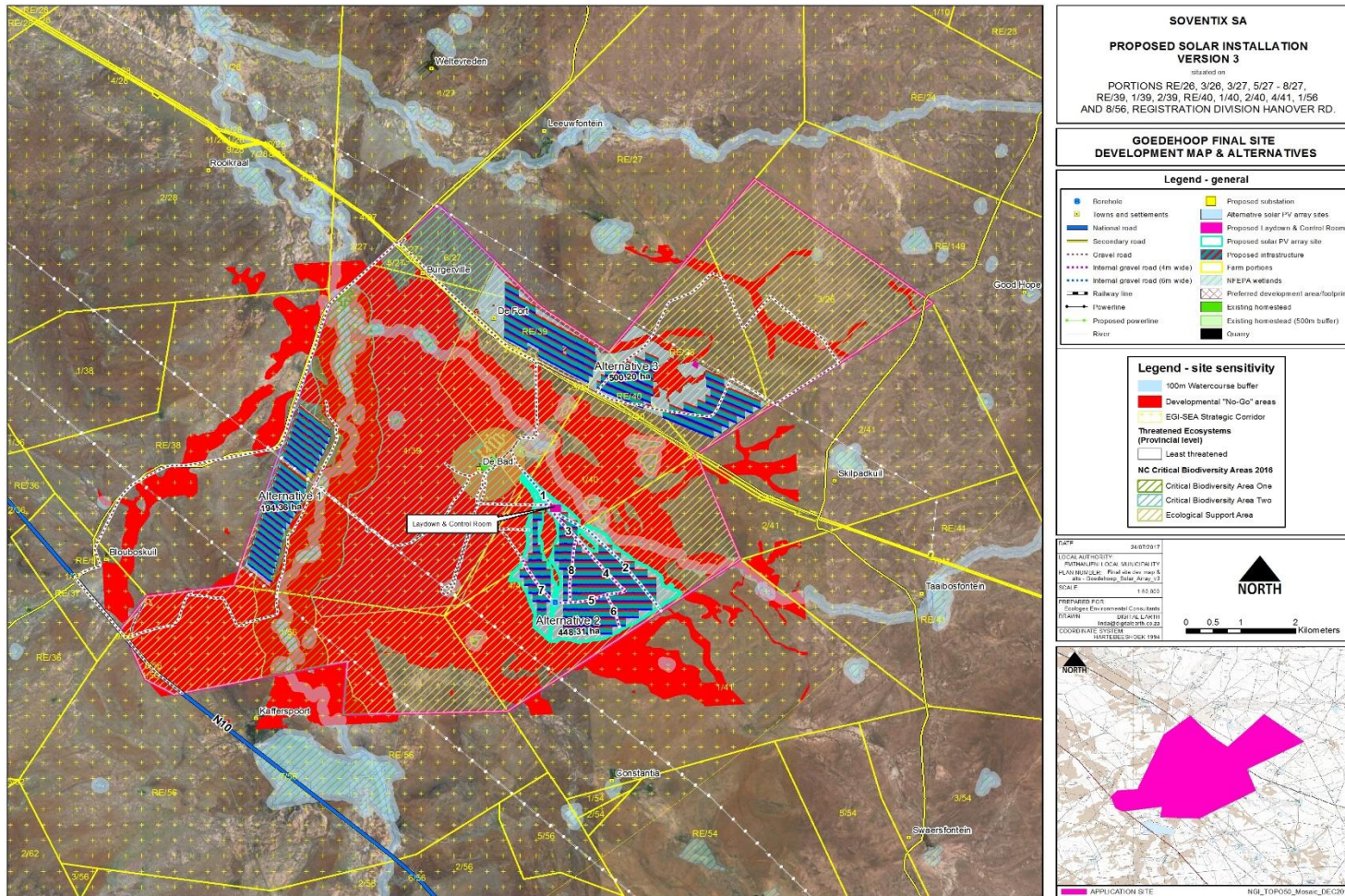


Figure 3. A map combining the final layout map superimposed (overlay) on the environmental sensitivity map (all sensitive areas consolidated & demarcated in red as “no-go” areas..

SECTION 5: ACTIVITIES, ASPECTS AND IMPACTS AND THEIR MANAGEMENT, MITIGATION & DESIRED OUTCOMES

(d) a description of the impact management outcomes, including management statements, identifying the impacts and risks that need to be avoided, managed and mitigated as identified through the environmental impact assessment process for all phases of the development including-

- (i) planning and design;*
- (ii) pre-construction activities;*
- (iii) construction activities;*
- (iv) rehabilitation of the environment after construction and where applicable post closure; and*
- (v) where relevant, operation activities;*

(f) a description of proposed impact management actions, identifying the manner in which the impact management outcomes contemplated in paragraph (d) will be achieved, and must, where applicable, include actions to -

- (i) avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation;*
- (ii) comply with any prescribed environmental management standards or practices;*
- (iii) comply with any applicable provisions of the Act regarding closure, where applicable; and*
- (iv) comply with any provisions of the Act regarding financial provisions for rehabilitation, where applicable;*

(g) the method of monitoring the implementation of the impact management actions contemplated in paragraph (f);

(h) the frequency of monitoring the implementation of the impact management actions contemplated in paragraph (f);

(i) an indication of the persons who will be responsible for the implementation of the impact management actions;

(j) the time periods within which the impact management actions contemplated in paragraph (f) must be implemented;

(k) the mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f);

(l) a program for reporting on compliance, taking into account the requirements as prescribed by the Regulations;

(m) an environmental awareness plan describing the manner in which-

(i) the applicant intends to inform his or her employees of any environmental risk which may result from their work; and

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

(n) any specific information that may be required by the competent authority.

The impacts are considered within the scope of the project, including but not limited to the Listed Activities. The relevant impacts resulting from Listed Activities and associated activities, including environmental, socio-economic and cultural heritage, are informed by a predetermined list of potential environmental impacts, comments received from Interested and Affected Parties and the findings contained in specialist studies that were used to generate the EIAr.

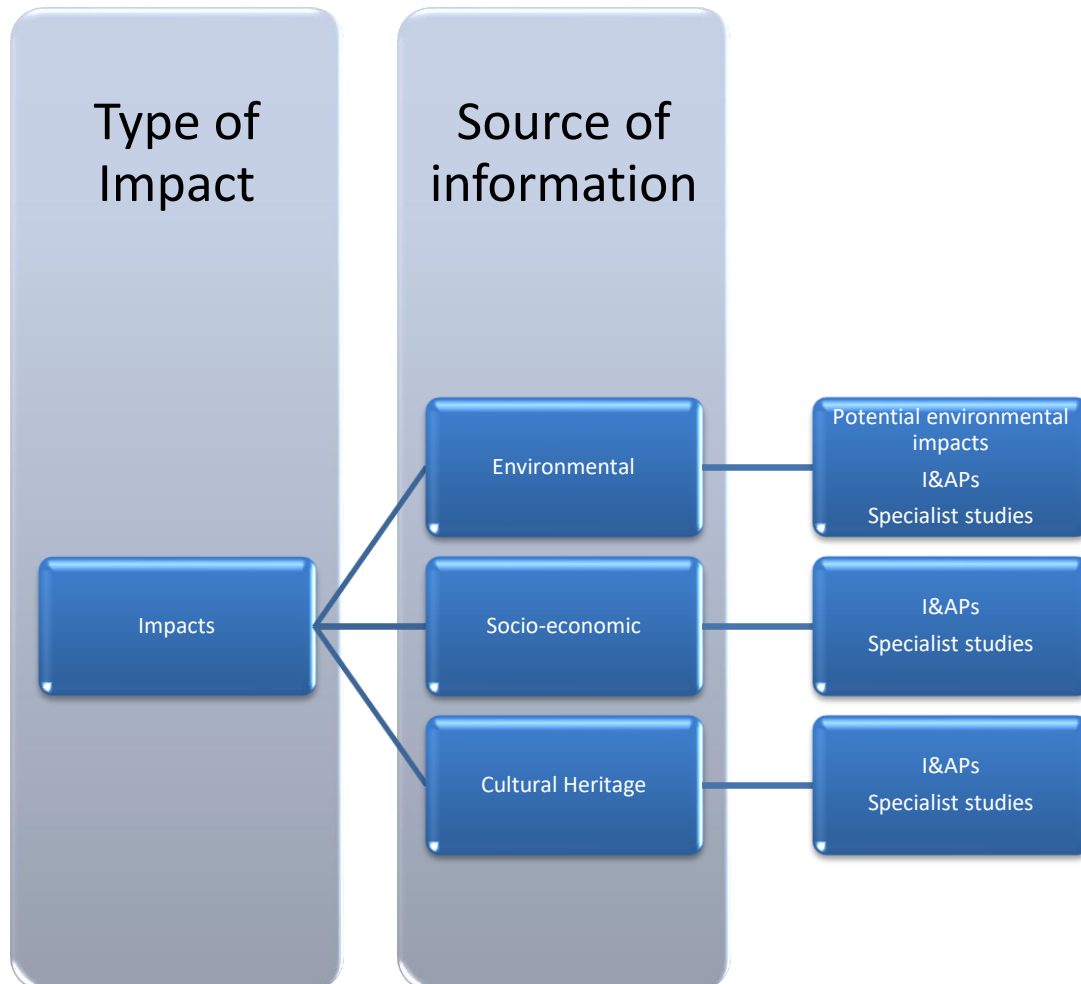


Figure 4: A breakdown of the different types of impacts including the resources used to identify them.

As stipulated in regulation 1.(1)(d) of Appendix 4 of the EIA regulation (2104), as amended; the setting of desired impact management outcomes forms the principle objective of an EMPr. Outcomes are driven by impact management actions including measures and mitigations to avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation; to comply with any prescribed environmental management standards or practices, including legal requirements and in some cases, best practice the Implementer aspires to (e.g. Equator Principles). The outcomes are achieved by implementing and achieving measurable Targets (both quantitative & qualitative). Management and mitigation measures are set to afford guidance and parameters to the implementer to achieve the set outcomes. The following section describes management programmes for the different

environmental attributes pertaining to the Project. As part of the Management Programmes, the section describes the potential environmental impacts which may result from the identified aspects / activities, the desired outcomes of mitigating these impacts as well as the targets used to measure the level of environmental compliance.

The following legislation, guidelines, departmental policies, environmental management instruments and / or other decision-making instruments that have been developed or adopted by a competent authority in respect of activities associated with a development of this nature, were identified and considered in the preparation of this EMPr:

1. BirdLife South Africa – Position statement on the effect of solar power facilities on birds.
2. BirdLife South Africa – Guidelines to minimise the impact on birds of Solar Facilities and Associated Infrastructure in South Africa
3. Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983), as amended.
4. Conservation of Agricultural Resources Act (Act 43 of 1983) and the regulations dealing with declared weeds and invader plants as amended from time to time;
5. Constitution of the Republic of South Africa Act (Act 108 of 1996), including section 24;
6. DEA (2010), Public Participation 2010, Integrated Environmental Management Guideline Series 7, Department of Environmental Affairs, Pretoria, South Africa.
7. Department of Environmental Affairs (2013). Draft National Renewable Energy Guideline. Department of Environmental Affairs, Pretoria, South Africa
8. DEAT (2002) Specialist Studies, Information Series 4, Department of Environmental Affairs and Tourism (DEAT), Pretoria.
9. DEAT (2004) Environmental Management Plans, Integrated Environmental Management, Information Series 12, Department of Environmental Affairs and Tourism (DEAT), Pretoria.
10. DWA (2007), Guideline for Developments within a Floodline (Edition 1), Department of Water Affairs and Forestry, Pretoria, South Africa.
11. DWS (2016) General Authorisation GN No. 509 in the Government Gazette No. 40229 dated 26 August 2016.
12. EIA Regulations, 2014 published in Government Notice No. R. 543, R. 544, R. 545, R. 546 and R. 547 in Government Gazette No. 38282 of 4 December 2014; and amended in GN No. R. 324, R. 325. R. 326 & R. 327 in Government Gazette No. 40772 of 7 April 2017;
13. Electricity Act (Act 41 of 1987);
14. Environment Conservation Act (Act 73 of 1989), including the noise regulations and litter controls promulgated thereunder;
15. Fencing Act (Act 31 of 1963);
16. General Authorisation in GN No. 538 in Government Gazette No. 40243 on 2 September, 2016.
17. Land Use Planning Ordinance (Act 15 of 1985)
18. Minerals and Petroleum Resources Development Act (Act 28 of 2002) (MPRDA);
19. National Building Regulations and Building Standards Act (Act 103 of 1977);
20. National dust control regulations. GG No. 36974, GN No. R. 827, 1 November 2013.
21. National Environmental Management Act (Act 107 of 1998) (NEMA);
22. National Environmental Management: Air Quality Act (Act 57 of 2003) (NEM:AQA);

23. National Environmental Management: Biodiversity Act (Act 10 of 2004) (NEM:BA);
24. National Environmental Management: Waste Act, 2009 (Act 59 of 2009) (NEM:WA);
25. National Forest Act (No 84 of 1998);
26. National Heritage Resources Act (Act 25 of 1999);
27. National Road Traffic Act (Act 93 of 1996);
28. National Veld and Forest Fire Act (Act 101 of 1998);
29. National Water Act (Act 36 of 1998);
30. Northern Cape Nature Conservation Act, 2009 (Act 9 of 2009);
31. Schedules 4 and 5 of the National Regulations regarding Noise Control made under Section 25* of the Environment Conservation Act, 1989 (Act 73 of 1989) in GN No. R 154 of Government Gazette No. 13717 dated 10 January 1992. (Note that this particular section of the Environment Conservation Act is not repealed by NEMA (Act 107 of 1998)).

The following management programmes aims to set management actions to achieve stated desired outcomes for each environmental aspect, including quantifying the measurable targets. While the impacts and management & mitigations have been addressed under the various project development phases, they are not intended to be mutually exclusive, and impacts from one phase are likely to occur in subsequent phases; but in the interest of reducing redundancy they have not been repeated for each phase. The appendices to this EMPr form part of the EMPr and must be implemented accordingly. In the event that conditions with the following tables in anyway contradict the conditions of the aspect specific Management Plans (MP) in the appendices, the MP conditions must take precedent.

Planning & Design Phase

Table 6. Potential offences prior to commencement of construction.

No.	Potential Impacts	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
6.1	PROTECTED SPECIES						
6.1.1	Comments received from Jacoline Mans, Chief Forester, DAFF: investigate potential impacts on NFA listed protected trees & obtain flora and fauna permits where necessary - clearing operations in the PV Solar Plant servitudes will	Comply with the relevant sections of the National Forest Act (NFA) (Act 84 of 1984).	Obtain the necessary permit for any listed species under NFA.	The applicant shall apply for and obtain the relevant licenses / permits from the appropriate authorities (DAFF, DEA, and Provincial Authority) prior to disturbing or destroying any protected species. The list of affected plants are contained in the Terrestrial Ecology Specialist Report, which records the following NFA listed species <i>Boscia albitrunca</i> ; will need to be searched	Applicant / Contractor to appoint botanist.	Prior to commencement of construction.	Compliance to be verified by ECO & IEA.

No.	Potential Impacts	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
	disturb or destroy natural flora and fauna, including protected species.			for & rescued if present, by a qualified ecologist / botanist prior to clearing operations.			
6.1.2	Protected flora & fauna are likely to be affected by the development for which the relevant permits must sought under the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004), and the Northern Cape Nature Conservation Act (Act 9 of 2009).	Comply with the relevant sections of the National Environmental Management: Biodiversity Act, 2004 (NEM:BA) (Act No. 10 of 2004), and the Northern Cape Nature Conservation Act (NCNCA) (Act 9 of 2009).	Obtain the necessary permit/s for any listed species under NEM:BA & NCNCA.	Obtain necessary Licenses / permits prior to impacting protected species in terms of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004), and the Northern Cape Nature Conservation Act (Act 9 of 2009). The following species will need to be searched & rescued (if present within the preferred footprint) by a qualified ecologist / botanist prior to clearing operations: <i>Stomatium pluridens</i> and <i>Euphorbia crassipes</i> , which are regional endemics and provincially protected, while other protected species include <i>Aloe broomii</i> var. <i>broomii</i> , <i>Aloe claviflora</i> , <i>Pachypodium succulentum</i> ,	Applicant / Contractor to appoint botanist.	Prior to commencement of construction.	Compliance to be verified by ECO & IEA.

No.	Potential Impacts	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
				<i>Ammocharis coranica</i> , and <i>Boscia albitrunca</i> .			
6.2	WATER USE AUTHORISATION TO WORK WITHIN A WATERCOURSE						
6.2.1	Excavation for the purposes of erecting pylons inside an extensive drainage system will require section 21 (c) & (i) water use entitlements.	Registration of General Authorisation permission for section 21 (c) & (i) water uses.	Relevant General Authorisation in place.	The applicant shall apply for a water use entitlement, i.e. a General Authorization for section 21(c) and (i) water uses, prior to constructing access roads and erecting pylons inside a watercourse.	Applicant / EAP.	Prior to commencement of construction.	Compliance to be verified by ECO & IEA.
6.3	WATER USE AUTHORISATION FOR TREATED EFFLUENT						
6.3.1	The operational phase of the plant will generate waste water through ablution and wash-up (kitchen) & shower facilities. The effluent will be treated in a package waste water treatment works (WWTW) (Biorock™	Registration of General Authorisation permission for section 21 (g) water use.	Relevant General Authorisation in place.	The applicant shall apply for a water use entitlement, i.e. a General Authorization for section 21(g) water uses.	Applicant / EAP.	Prior to commencement of construction.	Compliance to be verified by ECO & IEA.

No.	Potential Impacts	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
	system,) which will discharge into a seep-away site. Incomplete treatment of the effluent poses a risk of contamination to the receiving underground water resource.						
6.4	WATER USE AUTHORISATION FOR ABSTRACTION & STORAGE						
6.4.1	Comments received from Francois Taljaard , Town Planner, Emthanjeni Municipality: investigate potential impacts on the shortage of water - water may be abstracted illegally for use during construction and operation. In terms of	Registration of General Authorisation permission for section 21 (a) & (b) water uses.	Relevant General Authorisation in place.	Water required during construction and operation for human consumption (drinking, sanitation and food preparation), building activities (mixing concrete, watering gravel roads), livestock and maintenance (cleaning solar panels) shall be pre-authorised via a General Authorisation.	Applicant / EAP.	Prior to commencement of construction.	Compliance to be verified by ECO & IEA.

No.	Potential Impacts	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
	<p>section 25(1) of the NWA, 1998 the person authorized to use water for irrigation may request a water management institution to use some of that water for a different purpose, such as construction. In terms of section 25(2) of the NWA, 1998 a person holding an entitlement to use water may surrender that entitlement or part thereof to facilitate a license application for the use of water from the same resource in</p>						

No.	Potential Impacts	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
	respect of other land. A landowner may take water without a water use license but it is subject to the provisions and limitations prescribed in General Authorisation GN No. 538 published in Government Gazette No. 40243 on 2 September 2016.						
6.4.2	Comments received from Francois Taljaard , Town Planner, Emthanjeni Municipality states that the municipality will not be able to supply water to the project as the area's groundwater is already constrained.	Utilisation of borehole water within the General Authorisation limit and sustainable yield of the groundwater resource.	No deterioration in the static head of the borehole (considering seasonal & climatic variability).	Abstraction volumes must be measured and recorded against the static head of the borehole on a monthly basis to ensure the resource is not being depleted (taking cognisance of seasonal variability).	Applicant / Contractor.	Applicant.	Compliance to be verified by ECO & IEA.

No.	Potential Impacts	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
6.5	Access Roads						
6.5.1	The construction or expansion of any access roads will need to be authorised in terms of the NEMA listed activities, 2014 if they exceed certain thresholds.	Existing roads to be utilised with addition of service tracks within the development footprint.	Newly constructed access roads may not be wider than 4 metres with a reserve less than 13.5 metres, nor the widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre.	Prior to the construction of any new roads, where the current road network is inadequate, a search & rescue must be conducted by a suitably qualified specialist for protected fauna & flora and that of conservation concern; which must then be transplanted outside the works area in a comparative habitat type. Ascertaining similar habitat types may require soil sampling and analysis over and above above-ground similarities.	Applicant / Contractor / Botanist.	Prior to commencement & throughout construction.	Compliance to be verified by ECO & IEA.
6.6	Servitudes and Wayleaves						
6.6.1	The construction of the PV Solar Plant will intersect Eskom's servitude / power lines	Obtain the requisite wayleave from Eskom.	Wayleave issued by Eskom.	The applicant shall apply for a wayleave(s) from Eskom prior to commencing with construction within their servitude	Applicant / EAP.	Prior to commencement of construction.	Compliance to be verified by ECO & IEA.

No.	Potential Impacts	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
	(Distribution and/or Transmission). Construction without permission will constitute an offence in terms of the relevant legislation, including the Electricity Act, 1987 (Act 41 of 1987), as amended in 1994.						
6.7	Compliance Monitoring						
6.7.1	Construction could commence prior to the appointment of an Environmental Control Officer (ECO), which will be a contravention of the EMPr.	Ensure a suitably qualified and accredited ECO is appointed prior to commencement of construction.	ECO is to be appropriately registered with the South African Council for Natural Scientific Professions (SACNASP).	An experienced and independent ECO shall be appointed prior to the commencement of construction to oversee construction, including ensuring the identification and permitting / licensing of protected species prior to clearing.	Applicant	Prior to commencement of construction.	To be verified by IEA.
6.8	Municipal By-laws						
6.8.1	Comments received from Francois	Local municipality approval of	Issuance of a certificate	The plans and specifications for any building, whether of a temporary or	Applicant.	Prior to commencement	Compliance to be verified by

No.	Potential Impacts	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
	<p>Taljaard, Town Planner, Emthanjeni Municipality; approval of building plans before construction work can commence - Emthanjeni Local Municipality shall not issue a certificate referred to in section 118(1) of the Local Government: Municipal Systems Act, 2000 (Act No. 32 of 2000), regarding land, unless, <i>inter alia</i>, the Municipality is satisfied that any building erected on the land, in respect of which plans and specifications are to</p>	building plans.	referred to in section 118(1) of the Local Government: Municipal Systems Act (Act 32 of 2000).	permanent nature, to be erected on the land must be submitted to the Emthanjeni Local Municipality for approval in terms of the Local Government: Municipal Systems Act, 2000 (Act No. 32 of 2000).		of construction.	ECO & IEA.

No.	Potential Impacts	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
	be drawn and submitted to the Municipality for approval in terms of the Act, is properly erected and maintained in accordance with such plans and specifications.						

Table 7. Socio-economic considerations

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
7.1	The local community stands to gain from the suite of professionals that will be utilising local facilities (hospitality and others) that will provide economic benefits to the area during the planning phase.	Promote the use of local facilities to the professional team.	Furnished list of service providers.	Furnish all professional team members are provided a list of service providers that they can make use of, when undertaking project & site activities; in close proximity to the proposed project site, to maximise the nett financial benefit to the surrounding community.	Applicant / EAP.	At commencement of authorisation process.	N/A.
7.2	Job seekers are likely to begin enquiring about employment as awareness around the proposed project grows. This can become burdensome on the property owner should people arrive at the property	Provide a platform for job seekers from the onset of the planning process through to the operational phase.	Established employment system / database in place.	Develop a job seeker database, or integrate with an existing service provider in the adjacent towns, to ensure job seekers' details are captured. As positions become available, this database can be searched for suitable skills within the local populous before positions are outsourced. These measures will reduce the potential nuisance factor to the land	Applicant / Contractor.	Upon award of REFITT tender.	Compliance to be verified by ECO & IEA.

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
	owner requesting work and opportunities.			owner, caused by job seekers reverting to visiting the proposed site of development.			

Table 8. Rezoning and landuse practices

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
8.1	Comments received from Francois Taljaard , Town Planner, Emthanjeni Municipality; investigate rezoning of each site where development is to take place.	To have the land zoned or leased for the multiple land use practices	No commercial use of land in the absence of appropriate zoning or lease approval.	To avoid penalties and / or fines the applicant must not commence with construction until the rezoning application has received a successful and / or positive status.	Applicant / EAP.	Sub-division application upon successful award of REFITT tender.	Compliance to be verified by ECO & IEA.
8.2	Comments received from Jacoline Mans , Chief Forester, DAFF; ask for assistance from the National Department of Agricultural, Forestry and Fisheries for approval from the Minister under the Act 70 of 1970, with	Obtain the long-term lease permission for use of agricultural land for other land use practices. Obtain recommendation for sub-division.	Long-term lease approval in writing from Minister of DAFF. Recommendation letter in place for sub-division is long-term lease not approved.	Submit a long-term lease application to the National Department of Agricultural, Forestry and Fisheries for approval from the Minister under the Act 70 of 1970. Obtain the supported recommendation under the Sub-Division of Agricultural Land Act 70 of 1970 (SALA) land demarcated as agricultural land to another land use.	Applicant / EAP.	Long-term lease permission issued prior to commencement of construction. Sub-division support upon successful award of REFITT tender.	Compliance to be verified by ECO & IEA.

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
	respect to the land rezoning or leasing.						

Table 9. Layout and design including consideration of alternatives

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
9.1	Comments received from Jacoline Mans , Chief Forester, DAFF (Table 7); investigate impact on riparian vegetation - permanent footprints can destroy sensitive habitats, including Riparian vegetation.	Ensure all development is outside the riparian zone of affected watercourses.	Layout plans indicate development footprint is at least 100m outside of any watercourses.	Ensure that the preferred environmentally friendly layout and design is inclusive of all environmental aspects and impacts and employs the necessary mitigations to avoid watercourses and associated riparian zones with the requisite buffer zone. Provide the appointed surveyor with accurate coordinates of the Brak River and other potentially affected watercourses as well as the footprint boundary, to determine buffer extent.	Applicant / EAP.	At time of design & construction.	Compliance to be established by surveyor and verified by ECO & IEA.
9.2	Comments received from Bonnie Schumann , Senior Field Officer, Endangered Wildlife Trust (Table 7);	Ensure no riverine rabbits mortality or injury.	Effective search & rescue of any affected riverine rabbits.	The Terrestrial Ecology Assessment did not identify the presence of any riverine rabbits in the proposed development footprint but the development layout has been excluded from	Applicant / Contractor.	Design and during implementation of project.	Compliance to be established by EAP and verified by ECO & IEA.

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
	these are potential areas for Critically Endangered Riverine Rabbits, investigate Riverine Rabbit impacts - permanent footprints can destroy sensitive habitats, including Riverine Rabbit habitat.			watercourses, which is the riverine rabbit's preferred habitat type. Should subsequent siting's or surveys reveal their presence, a suitably qualified & accredited ecologist must be appointed to remove the affected specimens, following procurement of the requisite permits.			
9.3	Site clearing & exploration activities for site establishment would have a negative impact on biodiversity if this was not conducted in a sensitive manner.	Ensure site establishment footprint is in low biodiversity area.	Layout map indicates site establishment area in low sensitivity area.	Ensure that the preferred environmentally friendly layout and design is inclusive of all environmental aspects and impacts and implemented with the necessary mitigations.	Applicant / EAP.	At design & implementation phase.	Compliance to be established by surveyor and verified by ECO & IEA.
9.4	Collision mortality risk is a risk at solar	It has been suggested by	Design & construction of	The recommendations suggested by Visser (2016) should be	Applicant / Contractor.	At time of design &	Compliance to be established

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
	facilities. Birds, particularly waterbirds, have difficulty differentiating the expansive layout of panels, and see it as a solid structure; on which they may try to land and collide with the panels.	Visser (2016) that collision mortality could be reduced at solar facilities by using 28 cm-spaced contrasting bands or 10 cm spatial gaps between solar panels.	panels according to Visser (2016).	incorporated into new solar facilities until further research into panel design and layout suggests otherwise.		installation.	by appointed Engineer & verified by ECO & IEA.

Construction Phase

Table 10. Site establishment.

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
10.1	Light pollution impacts both negatively and positively on bats and can alter species composition, foraging patterns, reproductive success and predation rate (Stone et al. 2015). Research has shown that there are open-area foraging bat populations that may benefit from feeding on insects attracted to artificial light sources (Jones et al. 2009, Voigt et al. 2016). Conversely, if	To reduce artificial lighting impacts.	Documentation supporting selection of most suitable lighting alternatives.	Ensure downlighting is utilised to reduce the distance of visual intrusion, both to surrounding land users and wildlife. Lighting types that have a lower attraction value to insects must be selected preferentially. Construction shall be limited to daylight hours, and only lighting utilised at night for security purposes.	Applicant / Contractor.	During site establishment.	Compliance to be established by appointed Engineer & verified by ECO & IEA.

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
	artificial lighting is located close to roosting sites, the foraging emergence times of the bats can be delayed.						
10.2	Construction footprints can disturb immovable flora. i.e. operations buildings, transformers, inverters, pylons, rack foundations and the substation.	To select the most environmentally suitable site establishment footprint within technical capabilities.	Site establishment within boundary defined in layout plan.	<p>A layout plan must be developed for the full project including approved sites for site establishment including but not limited to laydown areas, stockpiles and stores.</p> <p>The site establishment footprint must be clearly demarcated on the ground to ensure that no construction creep results toward any watercourses or defined sensitive areas.</p> <p>A search and rescue must be undertaken of any and all footprints that will be temporarily or permanently affected during site establishment. All fauna and flora that are protected or of conservation</p>	Applicant / Contractor.	During site establishment.	Compliance to be established by surveyor and verified by ECO & IEA.

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
				<p>importance must either be cordoned off and protected, or translocated outside of the site establishment and solar PV footprint, into habitats of a similar nature. All search & rescue & translocation activities must be carried out by suitably qualified specialists.</p> <p>Defined sensitive areas must be demarcated as no-go areas that must be strictly enforced.</p>			
10.3	Placement of high risk (pollution generating) construction activities within close proximity to a watercourse can cause pollution.	High risk activities & facilities located at furthest practicable location from watercourses.	Hazardous stores, waste storage areas and other high-risk activities & facilities located away from watercourses.	<p>Activities with high pollution potential must not be located on the watercourse-side of established footprints, and adequate provision must be made to contain any waste streams from these activities.</p> <p>Establish and implement an Integrated Waste Management Strategy including avoidance, reduction, re-using, recycling and disposal, i.e. the production of</p>	Applicant / Contractor.	During site establishment.	Compliance to be verified by ECO & IEA.

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
				<p>hazardous waste can be avoided by providing drip trays, reduce waste by using the correct quantities, re-use concrete rubble as back fill or recycle steel off-cuts and dispose of non-hazardous solid waste at a registered municipal dump site.</p> <p>Washing of equipment including brushes shall not occur on site or in a watercourse, but shall be restricted to the main construction camp where adequate containment measures are in place.</p> <p>The contractor shall contain contaminated water from washing brushes in a conservancy tank until sufficient volume warrants disposal by a registered hazardous waste management company.</p> <p>Re-fuelling with a mobile fuel bowser shall take place outside any</p>			

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
				watercourse.			
10.4	Sedimentation of the watercourse can result from the erosion of exposed areas adjacent to or within the watercourse, including linear activities like pipelines or other cleared servitudes.	To ensure that infrastructure that impedes surface water flows does not negatively affect the area's hydrological patterns leading to erosion and / or sedimentation of receiving watercourses.	No erosion evident from site establishment activities, nor sedimentation evident in any watercourses.	Placement of infrastructure and laydown & stockpile areas must be done so as not to negatively affect surface water runoff in a way that leads to erosion and export of material to be deposited in any watercourses.	Applicant / Contractor.	During site establishment.	Compliance to be verified by ECO & IEA.
10.5	Placement of construction areas including toilets can be visually intrusive to sensitive receptors.	To reduce the visual impact of all structures as far as practicable.	Ablution facilities are suitably screened.	Ensure adequate ablution facilities are provided and are screened-off to reduce visual obtrusiveness.	Applicant / Contractor.	During site establishment.	Compliance to be verified by ECO & IEA.
10.6	Construction footprints can disturb sites of historical significance, i.e. Graves.	No impact to heritage sites.	Surveyed & incidental heritage sites secure & fenced-off.	No site establishment must be undertaken close to any identified heritage sites. These sites must be cordoned off and protected to avoid accidental damage.	Applicant / Contractor.	During site establishment.	Compliance to be verified by ECO & IEA.

Table 11. Access control including fencing of perimeter.

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
11.1	Electric fences can cause death or injury to mammals.	Ensure the fence installation does not cause mortality of indigenous wildlife.	Installation of electric fence above the risk height for wildlife and sheep.	Ensure electric strands are only installed along the top of the fenceline to mitigate unauthorised human access to the area, without posing a threat to fauna.	Applicant / Contractor.	During construction of fenceline.	Compliance to be verified by ECO & IEA.
11.2	Restricted access and management can prevent natural drivers, such as selective grazing pressures and fire from influencing species composition within the local plant community.	To maintain the current agricultural potential of the fenced areas.	Grazing of sheep within calculated grazing capacity.	Allow the landowners sheep to access the fenced-off footprint at the calculated grazing capacity (see Grazing Capacity report by F. de Wet, 2017) and return periods.	Applicant / Contractor / Landowner	During construction.	Compliance to be verified by ECO & IEA.
11.3	High walls and fences can be visually intrusive by visibly altering the natural landscape.	To utilise a fencing type with low visual impact.	Installation of least visually intrusive fencing option.	Ensure the full footprint perimeter is installed with the least visually intrusive fencing alternative	Applicant / Contractor.	During construction.	Compliance to be verified by ECO & IEA.

Table 12. Contractor's employees (staff conduct, movement).

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
12.1	Employees can harvest indigenous plants for muthi, firewood and poach animals.	To preserve the natural resource base of the affected property.	No unauthorised harvesting incidents of natural resources from the property.	A zero-tolerance policy must be implemented toward harvesting any natural products from the veld.	Applicant / Contractor.	During construction.	Compliance to be verified by ECO & IEA.
12.2	Excessive open-air ablutions can kill plants & cause unpleasant odours.	To ensure adequate ablution facilities are available.	Toilets available at a ratio of 1:10.	Adequate toilets must be available, including tracking active construction areas.	Applicant / Contractor.	During construction.	Compliance to be verified by ECO & IEA.
12.3	Work related activities extending beyond the footprint - called construction creep - can disturb habitats.	To ensure that construction and the workforce remains within the designated footprint.	No evidence of workforce activity outside the development footprint.	No staff must be permitted outside the designated construction area, to avoid contamination of watercourses and littering.	Applicant / Contractor.	During construction.	Compliance to be verified by ECO & IEA.
12.4	Daily transporting of employees, materials and equipment will have an impact on	To reduce nuisance and impact to existing road users in the area.	Accommodation & transport policy in place. No complaints	Adequate accommodation and transport must be provided for all staff to reduce impact on the local towns and road networks.	Applicant / Contractor.	During construction.	Compliance to be verified by ECO & IEA.

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
	existing road users.		lodged.				

Table 13. Construction of permanent & temporary access roads

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
13.1	Roads that alter surface water flow patterns within the local landscape will redistribute the availability of run-off as a source of water to plants - this impact is more significant in arid areas.	To reduce the impacts of existing access roads and service tracks on the flow patterns of surface water runoff.	No erosion of access roads due to inadequate drainage measures.	<p>The alignment and / or placement of access roads, relative to the prevailing slope and existing surface water (rainfall runoff) flow patterns must not cause erosion and / or sedimentation of a watercourse.</p> <p>Protect all areas (including rehabilitated areas) susceptible to erosion by installing all the necessary, temporary and / or permanent mechanisms for controlling / diverting storm water run-off, dissipating water energy and encouraging infiltration as soon as possible.</p> <p>Correct any cause of erosion at the onset thereof by controlling / diverting storm water run-off, immediately repairing and stabilizing / rehabilitating impacted areas in the most appropriate manner.</p>	Applicant / Contractor.	During construction.	Compliance to be verified by ECO & IEA.

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
13.2	Construction of service roads & tracks, will result in some habitat destruction and alteration. These activities have an impact on birds breeding, foraging and roosting in close proximity to the servitude through the modification of habitats and disturbance, particularly during breeding activities.	To utilise the existing road network as far as possible.	No new road construction, only necessary service tracks.	A formalised road network (including prioritisation of existing roads) will protect flora and fauna from off-road driving, and improves the visibility of fauna to drivers. Grading of existing farm roads must not be promoted, but farm tracks must be utilised as far as possible.	Applicant / Contractor.	During construction.	Compliance to be verified by ECO & IEA.

Table 14. Transport on site & accommodation of traffic (including parking areas)

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
14.1	Parking and driving carelessly can increase collisions with mammals, birds, reptiles, amphibians and insects - roadkills.	To avoid and minimise impacts from traffic on animals residing on and around the property.	Compliance to speed limits. No recorded project vehicle associated animal mortalities.	Drivers shall adhere to the relevant speed limit(s) (ON the existing road network) at all times and restrict their movements to the existing and / or approved roadway or servitude. The speed limit on the property shall be 40 km/h. A register must be maintained of all animal mortalities recorded on the property and localised access roads.	Applicant / Contractor.	During construction.	Compliance to be verified by ECO & IEA.
14.2	Dust entrainment from unsurfaced roads can result in unacceptably high dust fallout.	To manage dust entrainment on access roads which may not exceed the thresholds stipulated in the National Dust Control Regulations.	Full compliance with National Dust Regulations. Acceptable Dust fallout rate (mg/m ² /day): Residential area < 600	Dust suppression must be carried out on access roads where high dust entrainment is evident. To reduce water usage, a suitable soil binder must be used in dust suppression activities. Excessive water usage to control dust on dirt roads can cause erosion and lead to hazardous conditions for	Applicant / Contractor.	During construction, monthly.	Monitoring of dust fallout to be undertaken by professional service provider and compliance to be verified by ECO & IEA.

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
			<p>Non-residential area < 1200</p> <p>Exceedance not more than twice in a year, not sequential months.</p>	road users.			
14.3	Contamination from spills when refuelling, parking, driving, repairing, washing and operating plant or equipment to soil or nearby or within the watercourse.	To reduce contamination of soil from leaking plant and vehicles and upon occurrence is remediated promptly.		<p>Oil & fuel spills on roadways and parking areas must be removed to depth of penetration as soon as possible after their discovery and placed in a designated hazardous container for safe disposal.</p> <p>Drip trays must be placed under all plant that is parked overnight and extended periods not in operation.</p> <p>Drip trays can be filled with hydrophobic hydrocarbon absorbent material to avoid content being leached out during rainfall events.</p>	Applicant / Contractor.	During construction.	Compliance to be verified by ECO & IEA.

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
				<p>No servicing or washing of vehicles or plant may take place in parking bays, and all servicing must be done off-site, no service or wash-bays are to be constructed on site.</p> <p>Emergency breakdowns in the parking areas or along roads, must be addressed after adequate pollution containment measures have been implemented including but not limited to drip trays and spill kits.</p> <p>Refuelling of vehicles and plant may only take place at a designated and permitted (from local Fire Chief) fuel storage tank or mobile fuel bowser, under the guidance of a Specific Operating Procedure (SOP) that limits spillage and addresses remedial actions in the event of a spillage.</p>			

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
				Any topsoil removed during the establishment of parking areas and temporary roads, must be protected from vehicular and construction impacts.			
14.4	Delivery of the solar panels and the personnel trips will influence the existing traffic operations on the affected roads.	To reduce traffic related impacts from project related activities.	Compliance with EMPr mitigations & Traffic Management Plan (see Appendix 6).	It is anticipated that only the delivery of the solar panels and the personnel trips will influence the existing traffic operations on the affected road. The construction machinery will only have a traffic impact on delivery to and collection from the site and are therefore regarded as negligible.	Applicant / Contractor.	During construction.	Compliance to be verified by ECO & IEA.

Table 15. Sourcing & management of building material / sand.

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
15.1	Material will be required for building purposes & road maintenance.	Only existing borrow pits on the property are utilised and no new areas are mined.	No new borrow pits opened and no expansion to existing borrow pit extents. Copies of licensed commercial sand suppliers filed on site.	If building material is required, the contractor shall be permitted to borrow material from the on-site quarries without the need to apply for a permit or license in alignment with section 106 under the MPRDA, dealing with exemptions. In the event that the on-site quarries do not have the desired quality of material, licensed commercial sources will be used.	Applicant / Contractor.	Where applicable, valid commercial licenses provided prior to supply of material.	Compliance to be verified by ECO & IEA.
15.2	Water-filled borrow pits and quarries can result in animals & people drowning.	To ensure utilisation of the borrow pits does not increase risk of drowning to humans or livestock.	No water storage ability following rainfall events.	Ensure utilisation of sand from existing borrow pits does not result in storage of rainwater and runoff and that the profile remains free-draining. Storage of water will result in the need to apply for authorisation under the National Water Act (Act 36 of 1998). Ensure the free-draining nature of	Applicant / Contractor.	During construction.	Compliance to be verified by ECO & IEA.

				the borrow pits doesn't result in erosion and the export of material into watercourses.			
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Table 16. Stockpiling and material laydown areas (spoil, mulch, building sand, topsoil, windrows, material & equipment).

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
16.1	Material stockpiles and lay down areas can be located in undisturbed areas, trampling or smothering tunnelling, burrowing or nesting fauna in / on the ground.	To ensure stockpiles & laydown areas are located in the least environmentally sensitive areas.	Search & rescue register completed for laydown & stockpile areas.	Ensure the footprint of intended stockpile areas are searched for fauna and flora of conservation concern and protected status by a qualified ecologist, prior to allocation.	Applicant / Contractor.	During construction.	Search to be undertaken by qualified botanist & compliance to be verified by ECO & IEA.
16.2	Rainfall can wash soil stockpiles and windrows into a watercourse and cause sedimentation.	No loss via migration, of soil stockpiles, especially topsoil.	No losses in stockpiled material, especially topsoil – with no deposition into watercourses.	Ensure stockpile and laydown areas are not positioned close to watercourses - maintain the 100 m buffer around aquatic areas. Sediment traps may be necessary to prevent erosion and soil movement if there are topsoil or other soil stockpiles present during the wet season.	Applicant / Contractor.	During construction.	Compliance to be verified by ECO & IEA.
16.3	Stockpiles and windrows can impede and / or	To ensure that stockpile do not influence natural	No evidence of redistributed surface flows	Ensure stockpiles and laydown areas do not impede natural surface water drainage, resulting in erosion	Applicant / Contractor.	During construction.	Compliance to be verified by ECO & IEA.

	redistribute surface water flow patterns.	drainage patterns.	due to stockpile positions.	and export of the stockpiled material.			
16.4	Spoil, soil, mulch or any other stockpiles, if left on site, will remove natural habitat and will interfere with certain land use practices like agriculture.	To ensure no residual material is left on site following cessation of construction.	No evidence of residual material stockpiles.	No residues of stockpiled material must be left on site, that can impede restoration of ecological function and remain a visual intrusion on the landscape.	Applicant / Contractor.	During construction.	Compliance to be verified by ECO & IEA.

Table 17. Clearing and grubbing (fence line, operations area, access roads, rack foundations, transformers and inverters, cables, substation and pylons).

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
17.1	Direct contact with fauna and flora, including ground nesting birds and burrowing mammals, can cause injury or death. The impacts are exacerbated when the species affected are classified as protected, sensitive, rare, or threatened and endangered.	To minimise the impact on affected flora, fauna through clearing & grubbing.	No reported mortalities or injuries.	Search & rescue for protected flora & fauna must be undertaken by a qualified ecologist prior to clear & grub activities.	Applicant / Contractor.	During construction.	Search to be undertaken by qualified ecologist & compliance to be verified by ECO & IEA.
17.2	Construction activities, such as clearing, may extend beyond the development footprint, known as construction creep.	To minimise the areas to be cleared within clearly defined boundaries.	No evidence of construction creep.	Areas to be cleared must be clearly demarcated to avoid increasing the size unnecessarily. Site layout plans must be developed identifying all areas of activity to ensure clearing only happens in pre-	Applicant / Contractor.	During construction.	Setting out to be done by surveyor and verified by ECO & IEA.

				authorised areas and the location of topsoil stockpiles and / or windrows is clearly defined.			
17.3	Cleared and compacted areas without grass tussocks to impede surface water runoff, can increase surface water runoff, cause erosion and sedimentation, especially when adjacent to or within the watercourse.	To reduce the clearing of naturally vegetated areas, with consequent surface water induced impacts, to a minimum.	No evidence of erosion and / or sedimentation.	Storm water management measures must be implemented on all cleared surfaces to ensure no erosion and export of material occurs.	Applicant / Contractor.	During construction.	Compliance to be verified by ECO & IEA.

Table 18. Earthworks & excavations (associated with the operations area, road crossings, cabling, transformers and inverters, substation and pylons).

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
18.1	Open excavations can trap terrestrial fauna causing injury or death, including snakes.	To avoid mortality and injury to animals in and around earthworks.	All open excavations closed within 24 hours.	If trenches / excavations need to be dug for electrical cabling or other infrastructure, these should not be left open for extended periods of time as fauna may fall in and become trapped in them. Trenches which are standing open should have places where there are soil ramps allowing fauna to escape the trench.	Applicant / Contractor.	During construction.	Compliance to be verified by ECO & IEA.
18.2	Prolonged exposure of disturbed areas, including trenches, within a watercourse will increase the risk of seasonal flows, causing erosion and sedimentation.	To reduce impacts on aquatic environments resulting from earthworks.	No erosion evident while working within watercourses.	Ensure that water laden with silt does not exit excavations and cause sedimentation of aquatic and / or terrestrial systems.	Applicant / Contractor.	During construction.	Compliance to be verified by ECO & IEA.
18.3	Earthworks can unearth artefacts of archaeological	To reduce the damage to any incidental	Immediate cessation of activities upon	Any archaeological artefacts unearthed during excavations must be protected and left in situ. Works	Applicant / Contractor.	During construction.	Compliance to be verified by ECO & IEA.

	significance.	archaeological findings.	incidental find.	<p>must cease until the significance of the finding can be assessed by a qualified archaeological specialist.</p> <p>In the event of discovering a heritage resource, stop reconstruction activities and alert the SAHRA Archaeology, Palaeontology and Meteorites (APM) Unit immediately. Natasha Higgitt, Heritage Officer T: +27 21 462 4502 F: +27 21 462 4509 C: +27 82 507 0378. E: nhiggitt@sahra.org.za</p>			
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Table 19. Drilling, ram piling, erection & construction (associated with the rack foundations for the panel mounting hardware and fence poles).

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
19.1	Drilling generates dust emissions, especially under windy conditions.	To reduce dust emissions by drilling operations.	<p>Full compliance with National Dust Regulations.</p> <p>Acceptable Dust fallout rate (mg/m²/day): Residential area < 600 Non-residential area < 1200</p> <p>Exceedance not more than twice in a year, not sequential months.</p>	Dust suppressant must be prioritised for the drilling activities.	Applicant / Contractor.	During construction.	Compliance to be verified by ECO & IEA.
19.2	Drilling & ram piling machines can be noisy.	To reduce & manage noise emissions by drilling operations.	Noise must fall within the parameters set by:	Drilling operations must not be undertaken outside of normal working hours, in order to reduce noise impacts on affected	Applicant / Contractor.	During construction, monitoring via a noise meter –	Compliance to be verified by ECO & IEA.

			<p>1.(SANS) Standard 10103:2008: The measurement and rating of environmental noise with respect to annoyance and speech communication.</p> <p>2. DEA Regulations No. R.154. Noise Control Regulations promulgated in terms of Section 25 of the Environment Conservation Act, 1989 (Act No. 73 of</p>	landowners.		<p>daily or otherwise stipulated in the standard & regulation referenced.</p>	
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			1989). GG No. 13717, 10 January 1992.				
19.3	Drill holes can trap fauna, especially those filled with rain water or ground water.	To reduce the probability of small fauna being trapped in drilled holes.	Drilled holes plugged within 1 day.	Drilled holes may not be excavated more than one day prior to installing the panel arrays and wiring. Open holes must be plugged if infrastructure is not installed.	Applicant / Contractor.	During construction.	Compliance to be verified by ECO & IEA.

Table 20. Erection and construction of the panels arrays and associated infrastructure.

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
20.1	The construction of the proposed Solar facility and its associated infrastructure will have a visual impact on the scenic resources of this region.	To minimise the visual impact and sense of place.	Extent of visual impact does not exceed the projections of the Visual Impact Assessment.	Use visual screens to minimise the visual impact on the scenic resources of this region, where possible.	Applicant / Contractor.	During construction.	Compliance to be verified by Visual Impact Specialist, if deemed necessary.
20.2	Changes in landscape and habitat conversion can affect bat populations and assemblages on a local and regional scale.	To minimise impact on the bat population & assemblage.	Survey results of bat population & assemblages.	Permanent and temporary construction footprints (including fences) must be designated and positioned away from active bat populations, where possible. Invertebrate diversity will be influenced by botanical diversity as plants provide forage, habitat and structure for reproduction (Montag et al. 2016), and thus in turn may positively influence and possibly increase bat foraging activity.	Applicant / Contractor.	During construction, annually.	Monitoring to be undertaken during construction process to quantitatively verify population trends.

Table 21. Feeding or tying the solar PV plant into existing Eskom grid.

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
21.1	Pylons for the loop-in, loop-out overhead powerlines will be installed within the watercourse, acting as an impediment to surface flows and affecting the beds of the watercourse.	To preserve the hydrological integrity of the affected watercourse.	Maximised reduction in surface water hydrology.	Only impact an area of the watercourse that will be affected (do not demarcate large areas unnecessarily). Ensure that the necessary licenses and / or permits are in place before impeding the watercourse.	Applicant / Contractor.	During construction.	Compliance to be verified by ECO & IEA.
21.2	The power may need to be turned off when the solar PV plant is connected to the existing Eskom grid, temporarily disrupting the supply of electricity to local communities.	To minimise the interruption of electricity supply to affected users.	Effective communication followed by compliance with the commitments made.	Ensure that the municipality and / or public know of any possible interruptions in electricity supply timeously.	Applicant / Contractor.	During construction.	Compliance to be verified by ECO & IEA.

Table 22. Waste generation (solid waste including liquid waste, separation, storage and disposal).

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
22.1	The disposal or processing of packaging material must be addressed. Packaging material is currently being used in the townships for additions to houses, which is illegal and creates a fire hazard.	To implement an effective waste management strategy based on the waste hierarchy.	A well-managed and documented waste management system.	<p>Establish and implement an Integrated Waste Management Strategy including avoidance, reduction, re-using, recycling and disposal, i.e. the production of hazardous waste can be avoided by providing drip trays, reduce waste by using the correct quantities, re-use concrete rubble as back fill or recycle steel off-cuts and dispose of non-hazardous solid waste at a registered municipal dump site.</p> <p>Induct all labourers on the waste management strategy and enforce it through regular toolbox talks.</p> <p>Separate general, recyclable, natural (vegetation and soil/rock) and hazardous waste, and demarcate different containers for different waste types using colour codes.</p>	Applicant / Contractor.	During construction. Toolbox talks at least weekly.	Compliance to be verified by ECO & IEA.

				A dustbin shall be available at each work front during working hours.			
22.2	Construction activities will produce solid and liquid waste, which can contaminate the ground (litter, spillage) if improperly handled, stored or disposed.	To reduce the contamination of soil through poor waste management practices.	Quantified reduction in ground contamination events.	<p>Immediately remove contaminated soil to the depth of penetration and temporarily store in a designated solid hazardous waste container until sufficient volume warrants disposal at a registered hazardous waste dump site. Alternatively, onsite treatment of contaminated soil should be considered with a registered hazardous waste management company.</p> <p>Do not mix concrete on open ground. Mix in a wheel barrow, a mixing tray or on a level plastic sheet.</p> <p>The contractor shall prevent the run-off of slurry or cement contaminated water from concrete / plaster mixing sites.</p> <p>The contractor shall implement</p>	Applicant / Contractor.	During construction. Remove contaminated soil upon discovery.	Compliance to be verified by ECO & IEA.

				appropriate procedures, such as the use of a ground cover, to prevent the contamination of the ground when handling hazardous materials, including re-fuelling.			
22.3	Illegal dumping sites cannot retain the ecological functions and land use required to generate ecosystem goods and services and tangible economic benefits including income from conservation or farming.	Enforce proper and approved (legal) disposal of waste.	No illegal dumping events & verified proof of licensing of disposal sites.	<p>Do not litter, burn or bury waste on any property.</p> <p>The contractor shall dispose of general waste at a registered municipal dump site.</p> <p>The contractor shall return used oil to the supplier or an oil recycling company.</p> <p>Designate a temporary waste storage area, enclose it in a fence that cannot be breached by fauna, and provide sufficient scavenger proof dust bins with black bags inside the construction camp.</p>	Applicant / Contractor.	During construction.	Compliance to be verified by ECO & IEA.

Table 23. Handling of hazardous substances (fuel / oil, cement, bitumen, sewage/grey water) & management (including storage) at sanitation sites, kitchens, refuelling areas on site.

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
23.1	The release of hazardous substances and effluent can enter into and contaminate soil & groundwater resources, including but not limited to untreated waste water and unremediated spillages.	To reduce the release of hazardous substances into the receiving environment.	Constant improvement in the number of hazardous substance releases.	<p>Immediately remove contaminated soil to the depth of penetration and temporarily store in a designated solid hazardous waste container until sufficient volume warrants disposal at a registered hazardous waste dump site. Alternatively, onsite treatment of contaminated soil should be considered with a registered hazardous waste management company.</p> <p>The contractor is prohibited from discharging waste water, including domestic water from sanitation facilities, and grey water from washing equipment or plant into the environment.</p> <p>The contractor shall store hazardous material within a secure, safe and bunded facility at the</p>	Applicant / Contractor.	During construction.	Compliance to be verified by ECO & IEA.

				<p>construction camp.</p> <p>Use drip trays for refuelling, emergency repair & maintenance work and all stationary construction plant and equipment that can leak, such as TLBs, compressors and generators.</p> <p>The Waste Water Treatment Package Plant should be constructed at the onset of construction activities, to ensure the reduction of hazardous effluent production.</p>			
23.2	Concrete work, specifically mixing on bare ground can smother living plants and create a hard pan layer that prevents recovery.	To ensure that concrete work is never undertaken on bare soil.	All concrete works on a impermeable layer.	<p>Do not mix concrete on open ground. Mix in a wheel barrow, a mixing tray or on a level plastic sheet.</p> <p>The contractor shall prevent the run-off of slurry or cement contaminated water from concrete / plaster mixing sites.</p> <p>Break up all concrete hard pan</p>	Applicant / Contractor.	During construction.	Compliance to be verified by ECO & IEA.

				layers and dispose of appropriately (at a legitimate dump site) or re-use the concrete.			
23.3	Concrete ready-mix trucks can cause spillages, and if not supplied a dedicated area in which to clean their chutes, are likely to do so in the surrounding veld and on adjacent properties.	To ensure environmentally responsible practices of the ready-mix supply.	No incidents of unauthorised concrete spillage.	A dedicated, lined facility must be provided for ready-mix concrete trucks to wash their chutes, before leaving site. Once no longer needed this dry, inert waste can be disposed of at a local registered municipal landfill site.	Applicant / Contractor.	During construction.	Compliance to be verified by ECO & IEA.

Table 24. Completion of construction & rehabilitation.

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
24.1	Disturbed sites will comprise mostly cleared / denuded areas that are vulnerable to degradation, including erosion, leading to a loss of biodiversity and ecosystem functions and processes.	To avoid long-term degradation.	Rehabilitated state equal to the pre-construction state (except where degraded environments pre-existed, then improvement to stability of the system must be achieved).	<p>Bulk shape the areas where material is introduced to mimic or blend in with the surrounding, natural topography. Do not fine shape or rake because an uneven surface will impede surface water run-off and facilitate infiltration.</p> <p>Ensure storm water run-off is adequately controlled on disturbed sites before rehabilitating them (ripping, replacing the topsoil and mulching/brush packing), i.e. cut-off berms.</p> <p>Seed disturbed areas after construction with grass seeds of the naturally occurring plant species to encourage species richness.</p> <p>If erosion is found to occur during the aforesaid monitoring, the Contractor / Applicant shall</p>	Applicant / Contractor.	Post-construction.	Compliance to be verified by ECO & IEA.

				<p>immediately correct (the 'source') and repair (the 'symptom') the erosion using method(s) that are an improvement on the mitigations proposed in the EMPr or on the unsuccessful mitigations originally used on site.</p> <p>Kikuyu grass (<i>Pennisetum clandestinum</i>) is a highly invasive plant that threatens wetland habitats and must not be used in any rehabilitation efforts. Non-invasive indigenous grasses such as <i>Cynodon dactylon</i> must be used, or species best suited for that environment.</p>			
24.2	Disturbed areas, including those recently rehabilitated by the contractor are susceptible to weed, invader and alien plant recruitment and the replacement of indigenous plant	To prevent the maturation and reproduction of weed, invader and exotic plant species from occurring on any land that is rehabilitated after	No alien or invasive species present.	<p>The Contractor / Applicant shall immediately uproot, cut or debark weed, invader and alien plant species upon being identified, as appropriate.</p> <p>The Contractor / Applicant shall collect and destroy all seeds of weed, invader and alien plant</p>	Applicant / Contractor.	Post-construction.	Compliance to be verified by ECO & IEA.

	communities if not controlled.	construction.		species occurring within disturbed and / or rehabilitated areas.			
24.3	Incomplete or inadequate rehabilitation of all disturbed areas, construction areas, road servitudes and cut and fill slopes will not achieve desired ecological outcomes.	To ensure the rehabilitation & restoration of ecological function of disturbed areas.	Compliance with mitigations of the EMPr and Rehabilitation Management Plan (See Section 6 of EMPr).	Rehabilitate all disturbed sites and minimise overgrazing by mammals.	Applicant / Contractor.	Post-construction.	Compliance to be verified by ECO & IEA.

Operational Phase

Table 25. Facility operation & maintenance activities.

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
25.1	Gravel roads and fences are also sources of erosion if not maintained or managed because they channel uninterrupted flow of surface water runoff.	Stability of disturbed environments.	No visual evidence of erosion on access roads and fencelines.	All fences have to be maintained to ensure continued operational efficiency. Areas disturbed and rehabilitated during construction shall be monitored for signs of erosion and if found to occur, immediately corrected ('source') and repaired ('symptom').	Applicant / Operator.	Throughout operation.	IEA to verify in biannual audits.
25.2	Utmost care should be taken to not disturb nests that may be constructed on power line structures.	Stability of existing & new roosting birds' nests.	Nests listed during baseline assessment present throughout operation.	Any movements by vehicle and personnel should be limited to within the footprint of power lines and other associated infrastructure, especially during routine maintenance procedures.	Applicant / Operator.	Throughout operation.	IEA to verify in biannual audits.
25.3	Water required for human consumption and maintenance of the solar panels can	To use natural resources sparingly and sustainably.	Utilise the groundwater resource within the sustainable	Water meters will be installed at all abstraction points to ensure the volumes used falls within the resource capacity as well as legal	Applicant / Operator.	Throughout operation.	IEA to verify in biannual audits.

	be used excessively / wastefully.		yield and within promulgated abstraction rates.	limits.			
25.4	Increased human presence can lead to poaching, illegal plant harvesting and other forms of disturbance such as fire.	No unauthorised harvesting of natural resources.	No recorded incidents of illegal harvesting and / or complaints of such by landowners.	No dry wood, living plant or part thereof may be harvested from any plant community (including poaching of animals).	Applicant / Operator.	Throughout operation.	IEA to verify in biannual audits.
25.5	Impact of operational lighting on invertebrates, bats & birds.	To supply adequate lighting to ensure security of assets with limited dispersal to the surrounding area.	No light dispersal beyond the operational footprint.	If the site must be lit at night for security purposes, this should be done with downward-directed low-UV type lights (such as most LEDs), which do not attract insects. The use of lighting at night should be kept to a minimum, so as not to unnecessarily attract invertebrates to the solar facility and possibly their avian predators, and to minimise disturbance to birds flying over the facility at night.	Applicant / Operator.	Throughout operation.	IEA to verify in biannual audits.
25.6	The following identified by Simon	To minimize the impacts on	No noise related	Noise monitoring must take place following any complaints of a noise	Applicant / Operator.	Throughout operation.	IEA to verify in biannual

	<p>Todd (Fauna & Flora Assessment Study): The operation of the facility will generate noise and disturbance which may deter some fauna from the area. The areas inside the facility will require management and if this is not done appropriately, it could impact adjacent intact areas through impacts such as erosion, alien plant invasion and contamination from pollutants, herbicides or pesticides. The associated overhead power lines will pose a risk to avifauna</p>	<p>terrestrial & aquatic ecology.</p>	<p>complaints, no bird collision induced mortalities & no alien invasive plant occurrences.</p>	<p>generation nature. All incidents of bird collisions with panels should be recorded as meticulously as possible, including data related to the species involved, the exact location of collisions within the facility, and suspected cause of death. Post-construction monitoring with the aid of video surveillance should be considered, as this will contribute towards understanding bird interactions with solar panels. Alien invasive vegetation recruitment must be controlled within and along the fence lines of the solar PV footprints. Manual control measures are preferred, but where herbicides are used they must be those endorsed & selective for the target species with the lowest environmental toxicity. If birds are nesting on the infrastructure of the facility and cannot be tolerated due to</p>			<p>audits.</p>
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	<p>susceptible to collisions and electrocution with power line infrastructure.</p>			<p>operational risks of fire, electrical short, soiling of panels or other problems, birds should be prevented from accessing nesting sites by using mesh or other manner of excluding them. Birds should not be shot, poisoned or harmed as this is not an effective control method and has negative ecological consequences. Birds already with eggs and chicks should be allowed to fledge their chicks before nests are removed.</p>			
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Table 26. Decommissioning phase

No.	Potential Impact	Desired Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
26.1	Incomplete or ineffective decommissioning of the site will not allow for the restoration of the full property to agriculture and wild life land uses.	To undertake decommissioning in a responsible and environmentally responsible manner.		<p>Soventix undertakes to adhere to prevailing internationally & nationally recognised protocols and procedures</p> <p>The EU have undertaken for the collection of 85 % of all end-of-life photovoltaic modules in Europe. Of those, 80 % must be recycled.</p> <p>Should the Electronic Waste Association of South African (e-WASA) establish a more stringent protocol regarding the recycling and handling of solar panels, Soventix will comply.</p>	Applicant / Operator.	Throughout operation.	IEA to verify in biannual audits.
26.2	Authorisation prior to decommissioning	To comply with prevailing environmental legislation governing any requirements to	100% legal compliance.	Current South African environmental legislation requires an application for environmental authorisation prior to decommissioning facilities for which environmental authorisation was originally required for its	Applicant / EAP.	At termination of operation.	N/A.

		apply for authorisation for decommissioning.		development in the first place. It is possible that such authorisation may be required at the time of decommissioning.			
26.3	Extension of tenure.	To allow for the sustainable continuation of the activity post the current envisaged operational term.	Compliance with prevailing legislation, lease extension and other contractual-legal obligations.	In the event that an extension is granted to the power purchase agreement, consideration would be given to infrastructure upgrade and the deploying of more advance technologies.	Applicant.	At termination of operation.	N/A

SECTION 6: ENVIRONMENTAL AWARENESS PLAN (Cape Lowlands Environmental Services, 2012)

This section of the report is included in compliance with Section 24N(3)(c) of the NEMA and the EIA Regulations (2014) as amended.

The EMPr needs to include, inter alia:

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;*

Throughout the construction & operational phases environmental as well as health and safety awareness training should be provided to all employees in order to promote the effective implementation of the EMPr actions.

This section of the report focusses on the environmental awareness training. It provides a guideline as to the possible environmental risks that may be experienced as part of the project as well as way to avoid the risks and subsequent environmental degradation. The aim is to provide a guide to developing a comprehensive yet easily understandable awareness plan to present to employees of all education and skill levels which should be presented to the employees at least one week prior to commencement of construction. The following pointers are given for the environmental awareness training course:

- Environmental awareness training should be undertaken by the environmental and / or health and safety representative of Soventix with the input of an EAP or ECO if required;
- Environmental awareness reminders should be undertaken at least bi-annually to ensure that employees and Contractors are kept aware of the risks and management thereof;
- It is recommended that awareness posters be developed and placed on site in highly visible areas to provide the required information when it needs to be referred to as well as reminding employees of their obligations with regard to environmental protection;
- A slideshow can also be developed for initial awareness induction and for use as a reminder of the environmental risks and responsibilities at the site or induction of future Contractors; and
- Throughout the presentations (posters, meetings, slideshows, etc.), it is recommended that visual aids be used to explain the potential risks and management thereof as thoroughly as possible.

Should any new personnel be contracted or arrive on site during the construction period, they should attend the environmental awareness course. The environmental awareness training should be provided to all labourers, technical staff and any other Contractor appointed.

The awareness training forms part of this EMPr and should be implemented as part of the conditions of environmental management and risk prevention. Refer to the management measures in Tables 6 through 26 above for proposed management and mitigation actions to be

undertaken in order to prevent or minimise the risks described below. Attention should be focussed on the following areas of sensitivity during the construction phase:

- Removal of vegetation during site clearance;
- Animal habitat disturbance due to vegetation clearance;
- Soil erosion and pollution;
- Soil compaction;
- Health and safety;
- Degradation of roads; and
- Fire risks.

Other elements to be taken into consideration by the employees during both the construction and operational phases include:

- The presence of animals on site;
- Disturbances to neighbours due to noise and traffic;
- The positive impacts, of the greener technology being implemented, on the biophysical and socio-economic environments; and
- Awareness should be raised regarding the possible occurrence of sensitive plant and animal species and heritage features.

The awareness training for this project should aim to prevent, and where prevention is not possible, mitigate detrimental environmental impacts. It should promote awareness of environmental risks and management thereof. It should furthermore promote green thinking and provide information on alternative energy sources and energy consumption reduction.

SECTION 7: RESPONSIBILITIES OF ROLE PLAYERS

The approved EMPr shall be printed, completed and kept in an on-site file designated for all matters pertaining to environmental management. Co-operation is required between the applicant, contractor, and ECO to ensure that activities are managed in an amicable and responsible manner and in accordance with the philosophies of environmental legislation and principles of the EMPr.

This EMPr is predominantly compiled for the management of construction & operations associated with the development of a solar PV facility, once the Planning and Authorisation phases are complete. The tabulated management programmes assign responsibilities to one or more role player, the below descriptions identify responsibilities and accountabilities in the case of any uncertainty.

Applicant

The applicant remains ultimately accountable for ensuring that the development is implemented according to the requirements of the EMPr. Although the applicant delegates specific responsibilities to role players to perform functions on his / her behalf, the ultimate accountability cannot be delegated. The developer is responsible for ensuring that sufficient resources (time, financial, man-power, equipment, etc.) are available to the other role players (e.g. the contractor, SECO, etc) to efficiently perform their tasks in terms of the EMPr. The responsibility of restoring the environment in the event of any negligence, which leads to damage of the environment, also falls to the applicant.

The applicant must ensure that the EMPr is included in any documents (tender, appointment etc.) so that any contractor who is appointed is bound to the conditions of the EMPr. The applicant must appoint an independent Environmental Control Officer (ECO) prior to commencement of construction, to help identify pre-construction & construction criteria that need to be fulfilled timeously, to avoid non-compliance with the overarching authorisation conditions and / or legislation.

Contractor

The contractor, as the developer's agent on site, is bound to the EMPr conditions through his / her contract with the developer, and is responsible for ensuring that she / he adheres to all the conditions of the EMPr. The contractor shall be responsible for the actions undertaken by all their employees including sub-contractors. The contractor must thoroughly familiarise him / herself with the EMPr requirements before coming onto site and must request clarification on any aspect of these documents, should they be unclear. The contractor must ensure that he / she has provided sufficient budget for complying with all EMPr conditions at the tender / appointment stage.

The contractor must comply with all instruction (whether verbal or written) given by the environmental manager, project manager or site engineer in terms of the EMPr.

Site Environmental Officer (SEO)

The Site Environmental Officer (SECO) shall be appointed by the contractor to implement the EMPr daily. The SEO shall ensure that all construction activities are carried out in accordance with the relevant conditions of the EMPr, Environmental Authorisation (EA), General Authorisation (GA) or Water Use License (WUL) (under the National Water Act), wayleaves, provincial ordinances & provincial bylaws.

Environmental Control Officer (ECO)

The Environmental Control Officer (ECO) is appointed by the applicant as an independent monitor of the implementation of the EMPr, EA & GA / WUL. He / she must form part of the project team and be involved in all aspects of the project planning that can influence environmental conditions on the site.

The ECO must attend relevant project meetings, conduct inspections to assess compliance with the EMPr, EA & GA / WUL and be responsible for providing feedback on potential environmental problems associated with the development. In addition, the ECO is responsible for:

- Liaising with relevant authorities;
- Liaising with contractors regarding environmental management; and
- Undertaking routine monitoring and appointing a competent person / institution to be responsible for any specialist monitoring (if required).

The ECO has the right to enter the site and undertake monitoring and auditing at any time, subject to compliance with health and safety requirements applicable to the site (wearing safety boots, head gear, mouth mask etc.).

Independent Environmental Auditor (IEA)

An IEA shall be appointed by the Applicant to undertake EMPr, EA & GA / WUL compliance audits at 6-monthly intervals. The purpose of conducting a periodic compliance audit would be to systematically check and evaluate progress on EMPr, EA & GA / WUL implementation. The environmental audit will serve as a 'snapshot' of the environmental situation and progress at a given point in time. The purpose of the audit is to illustrate whether there has been any improvement or change over time.

The IEA will fulfil the auditing requirements by systematically auditing the Project's performance & compliance against the requirements of the EA, EMPr & GA / WUL in a process that is carefully planned, structured and organised. The audit process must, on a sampled basis, track past actions, activities, events, and procedures through using existing documentation, conducting interviews with managers and personnel, and observing practices on site.

SECTION 8. COMMUNICATION

At least monthly site meetings should be held where feedback can be given and any potential problems identified and remedied. If they cannot be remedied then construction in that area should be stopped, until a suitable remedy is identified.

Monitoring Compliance

Pre-construction, Construction and Post-construction:

The ECO will be responsible for monitoring and reporting on compliance of the activity from pre- to post-construction.

Inspections and resulting compliance reports shall be a systematic, independent and documented process for obtaining compliance evidence and evaluating it objectively to determine the extent to which the compliance criteria are fulfilled. The compliance criteria (or reference) against which the compliance evidence is compared shall include this EMP, the Environmental Authorisation & General Authorisations or a Water Use License (under then National Water Act).

The ECO must undertake bi-weekly inspections of the site and submit monthly environmental compliance reports to the National Department of Environmental Affairs (DEA) as the competent authority for this project, unless otherwise prescribed in the EA. The compliance reports must identify the actual and potential transgressions, describe the impacts, provide verifiable evidence (photographs, records or statements) and recommend corrective and preventive actions (including completion dates). The compliance reports must measure the applicant / contractor's level of compliance against the aforesaid criteria. Performance scoring / reporting is optional.

The SECO shall maintain an on-site diary to record environmental aspects (elements of the construction activities that can interact with the environment) and environmental impacts (any change to the environment, whether adverse or beneficial, wholly or partially resulting construction activities), daily.

Operation:

The relevant authorities should be responsible for monitoring compliance with aspects of the activity that fall within their jurisdiction.

Time Periods and Failure to Comply with the EMP

The time periods within which the measures prescribed in this EMP must be implemented shall be applicable to the full duration of the activity that is being undertaken and mitigated. The time periods within which corrective and preventive actions need to be implemented shall be determined by the SECO and / or ECO, depending on the nature and severity of the finding. In the absence of a prescribed deadline or completion date, findings shall be corrected or prevented immediately upon being found to occur, if practical.

The EMP is a legally binding document and should form part of the contract. Should there be failure to comply with the EMP the following steps are envisaged:

Step 1

The ECO meets with the contractor and points out the deviation from the EMPr. The ECO and Contractor agree on a solution and this non-compliance is recorded by the ECO as well as the solution put forward to rectify it.

Step 2

Should there still be non-compliance or there is a more serious infringement of the EMPr the contractor is informed in writing with a deadline by which the problem must be rectified. Any extra costs that may be accrued must be borne by the contractor.

Step 3

If non-compliance persists, the Chief Resident Engineer (CRE) or Project Manager (PM) shall order the contractor to suspend construction in that specific area or the project as a whole until the activity at variance with the EMPr is corrected and or remedial actions taken. Any cost that occurs as a result of such action shall be for the account of the contractor.

Step4

Where there is non-compliance with the EMPr and no evidence that the contractor intends complying even though the above 3 steps have been taken the applicant may terminate the contract due to non-compliance (breach of contract). Such measures do not replace any legal proceedings that may occur as a result of such non-compliance.

Environmental Awareness Plan

The applicant shall ensure that his project team, contractor and labourers are adequately trained with regard to the implementation of the EMPr, EA & GA / WUL throughout construction.

Pre-construction

Environmental Awareness Inductions shall be targeted at two distinct levels of employment: management (applicant, architect, engineer, contractor / site agent) and labourers (including the site foreman). The SEO shall be responsible for preparing and presenting inductions appropriate to the audience. Inductions shall be undertaken prior to the commencement of construction. Where possible the presentation will be conducted in the language of the employees.

The Environmental induction for management shall include mitigations that are relevant to or require management's involvement prior to implementation including, but not limited to, the following:

- Measures required during the Planning and Design, and Pre-construction phase, and
- Site establishment.

The Environmental induction for the contractor's labourers and foreman shall, as a minimum, include the following:

- A description of the actual and potential environmental impacts,
- Standard operating procedures for undertaking construction activities (i.e. mixing concrete, driving, etc.) that can have an environmental impact,
- Staff conduct including sanitation and movement,
- The integrated waste management strategy,
- The steps to be taken should any item of perceived environmental importance including archaeological artefacts be located or unearthed, and
- The environmental emergency plan.

Construction

The SEO and ECO shall undertake an informal training needs analysis throughout construction to identify appropriate environmental topics and the appropriate labourers to target. The analysis shall be informed by the findings contained in the site diary and compliance reports. Training shall be given during toolbox talks.

The SEO and ECO shall keep records of the environmental inductions and subsequent toolbox talks in an on-site file designated for all matters pertaining to environmental management.

SECTION 9: ENVIRONMENTAL EMERGENCY PLAN FOR THE CONTROL OF ENVIRONMENTAL INCIDENTS

Definition of an 'Environmental Incident'

1. An unexpected sudden occurrence including a major emission, fire or explosion leading to serious danger to the public or potentially serious pollution of or detriment to the environment whether immediate or delayed (NEMA, 1998, section 30 (1) (a)).
2. Any incident or accident in which a substance-
 - (a) pollutes or has the potential to pollute a water resource or
 - (b) has, or is likely to have, a detrimental effect on a water resource (NWA, 1998, section 20 (1))

Procedure

The contractor shall ensure that emergencies are reported and controlled in accordance with the sequence of events prescribed for spillages in a watercourse, on land and fire, including:

- Action to be taken
- Removal and remediation measures to be implemented
- Internal and external communication plan
- Prescribed reporting procedure

The contractor shall ensure that their employees are adequately trained to react to environmental emergencies in accordance with this procedure.

The SECO shall complete the table of contact numbers, erect them in a conspicuous place within the construction camp and make its whereabouts known to all of the contractor's staff.

Equipment

The following equipment is required to successfully implement this procedure. It must be ensured that the equipment is supplied to or is readily available for all living quarters, site offices, kitchen areas, workshop areas, stores and on site.

1. A spill kit including absorbent fibres, mats and booms
2. A net
3. A whistle
4. Adequate lighting for night shifts
5. Spades
6. Sand bags
7. Designated hazardous waste drums
8. (Trained personnel with) protective clothing for extinguishing fires
9. Fire extinguishers
10. Fire beaters
11. Water carts/tankers with pumps and hoses
12. Water pumps and pipes (for fires started at the watercourse crossings)

Contact Numbers

Organisation	Name	Telephone/cell Number
Project Personnel		
Applicant		
Engineer		
Contractor		
HSO		
SEO		
ECO		
Interested and Affected Parties		
Land Owner		
Adjacent Land Owner		
Adjacent Land Owner		
Emergency Services		
Spill Clean-up Service Provider		
Fire Department		
Chief Fire Officer (Fire Chief)		
SA Police Services		
Disaster Management Centre		
Local Municipality		
District Municipality		
Irrigation Board		
Water Catchment Management Agency		
Water Treatment Works		
DWS (Regional Head of Department /		

Chief Director)		
DWS (Regional Director: Water sector Regulation & Use)		
DEA (Provincial Head of Department)		
DEA (Director: Environmental Impact Management)		
DEA (Director General)		
DEA (Director: Environmental Impact Evaluation)		

SPILLAGE IN A WATERCOURSE

ACTION TO BE TAKEN		
Personnel	Responsibility	Action
Employee	Reporting	The person responsible for, or who discovers, a hazardous substance spill must report the incident to their immediate Supervisor.
Supervisor	Reporting	Report the incident to the SEO, HSO and Resident Engineer. <ul style="list-style-type: none"> Note that the SEO will take control of all relevant actions once he/she arrives on the scene.
HSO	Reporting	Report the incident to an Inspector (designated under section 28 of the Occupational Health & Safety Act, 1993) within the prescribed period and manner.
Supervisor / SEO	Initial investigation	Determine the extent of the spill, i.e. its boundaries, by observing for the following: <ol style="list-style-type: none"> Any visual indication of pollution, Any odours or emissions detected, Any indication of the source of pollution, Any sign of damage to the natural system. <ul style="list-style-type: none"> The Supervisor / SEO should provide lighting if working at night.
Supervisor / SEO	Co-ordination	Sound an alarm/whistle. <ul style="list-style-type: none"> The designated response team consisting of area specific personnel and including the environmental leader, will congregate at the spill kit. All other employees who do not have specific duties to perform are to evacuate the affected area to a location designated by the Supervisor / SEO.
Supervisor / SEO	Co-ordination	Minimise the effects of the incident on the environment and persons by removing the source of the spill at least 100m away from the watercourse or cut-off the supply of the spill if the source is not moveable.
Supervisor / SEO	Co-ordination	Contain the spill by laying an absorbent sock or boom across the width of the watercourse AT A PRE-DETERMINED LOCATION downstream of the construction area (spill). <ul style="list-style-type: none"> A series of parallel booms may be required.
Supervisor / ECO	Co-ordination	Secure the affected area with danger tape.

HSO	Co-ordination	The site shall not be disturbed and no article or substance may be removed (without the consent of the inspector) if there is or likely to be a death, or if there is a loss of limb or part of a limb. However, action can be taken to prevent a further accident, to remove the injured or dead or rescue persons from danger.
Engineer / SEO / HSO	Decision-making	The Engineer will assess the situation in consultation with the SEO and HSO and act as required. <ul style="list-style-type: none"> ● The risk involved shall be assessed before anyone approaches the scene of the incident. ● The HSO will consult the MSDSs. ● The scale of the spill will dictate whether the spill will be cleaned up by using the on-site spill kit and in the prescribed manner, or by contacting a Spill Clean-Up Service Provider for assistance. ● The SEO will take photographs of the affected area. ● No person shall be allowed to approach a spill unless he/she is equipped with the personal protective clothing.
SEO	Directions	If a Spill Clean-Up Service Provider is used, assist the emergency services by clearly marking the route to be taken to the spill site.
SEO	Co-ordination	Take such measures as the Catchment Management Agency may either verbally or in writing direct within the time specified by such institution.

SPILLAGE IN A WATERCOURSE

REMOVAL AND REMEDIATION MEASURES TO BE IMPLEMENTED		
Personnel	Responsibility	Action
SEO	Co-ordination	Remove the contaminated sock or boom from the surface of the water. If lose fibres were scattered on the surface to capture hydrocarbons in shallow (still) pools, 'fish' it out with a net.
SEO	Co-ordination	Remove the contaminated soil from the banks of the watercourse, to the depth of penetration using a spade or shovel.
SEO	Co-ordination	Temporarily store the contaminant in the designated hazardous waste facility at the construction camp.
SEO	Co-ordination	Contact a licensed hazardous waste service provider to collect and transport the waste to a licensed hazardous waste landfill site.
SEO	Co-ordination	Rehabilitate the banks of the watercourse by replacing the topsoil and planting indigenous plants.
SEO	Monitoring	Immediately follow any known spillage of toxic substances into a stream or river with monitoring of the receiving streams or rivers and public health.
SEO	Co-ordination	Should water downstream of the spill be polluted, and fauna and flora show signs of deterioration or death, specialist hydrological or ecological advice must be sought for appropriate treatment and remedial procedures to be followed.
SEO	Monitoring	Take photographs of the affected area during rehabilitation.

SPILLAGE IN A WATERCOURSE

INTERNAL & EXTERNAL COMMUNICATION PLAN		
Personnel	Responsibility	Action
Employee	Reporting	The person responsible for, or who discovers, a hazardous waste spill must report the incident to their immediate Supervisor.
Supervisor	Reporting	Report the incident to the SEO, HSO and Resident Engineer.
HSO	Reporting	Report the incident to an Inspector (designated under section 28 of the Occupational Health & Safety Act, 1993) within the prescribed period and manner.
SEO	Reporting	Report the incident to the Site Agent and / or Manager and the ECO.
SEO	Reporting	If the spill is too big for the spill kit, contact a Spill Clean-Up Service Provider.
SEO	Reporting	If the spill is going to affect downstream users, inform the Land Owner, the Irrigation Board and water treatment works (if applicable). <ul style="list-style-type: none"> ● Provide the following information to the water treatment works: <ol style="list-style-type: none"> 1. The exact location of the spillage, 2. The time of the spillage, 3. As much information about the nature of the pollution, 4. The name and telephone number of the person contacting them. ● Irrigation Boards control river structures and may be able to divert/or impound the river to protect 'water supply intakes'.
SEO	Reporting	Report the incident to the following authorities within 24 hours. <ol style="list-style-type: none"> 1. DEA (Director General), 2. DWS (Director General and Chief Director), 3. SA Police Services, 4. Fire Department, 5. Catchment Management Agency, 6. DEA (provincial Head of Department) or Local Municipality, and 7. Any persons whose health may be affected by the incident.

SEO	Reporting	<p>Provide the following information:</p> <ol style="list-style-type: none"> 1. The nature of the incident, 2. Any risks posed by the incident to public health, safety & property, 3. the toxicity of substances or by-products released by the incident, and 4. any steps that should be taken in order to avoid or minimise the effects of the incident on public health and the environment.
ECO / Applicant / Site Agent / CRE	Reporting	<p>If the nature of the impact constitutes a gross violation of the EA or any legislation:</p> <ul style="list-style-type: none"> ● The ECO must report the incident to the applicant. ● The applicant must report the incident to the Local Municipality, DEA, and DWS. ● The Site Agent and / or Manager must report the incident to their Environmental Group Manager, Divisional MD and CEO. ● The Resident Engineer must report the incident to his Superiors.

SPILLAGE IN A WATERCOURSE

PRESCRIBED REPORTING PROCEDURE		
Incident recording		
Personnel	Responsibility	Action
SEO	Investigation	Conduct an investigation, including interviews, and record all details of the incident. ● The cause must be investigated.
SEO	Reporting	Complete an Environmental Incident Report and forward it to all key project personnel, with the exception of the Emergency Services.
SEO	Reporting	Within 14 days of the incident, report the incident to the following authorities. 1. DEA (Director General), 2. DEA (Provincial Head of Department), 3. Local Municipality, 4. DWS (Regional Director).
SEO	Reporting	Provide the following information: 1. The nature of the incident, 2. The substances involved and an estimation of the quantity released and their possible acute effect on persons & the environment & data needed to assess these effects, 3. Initial measures to minimise impacts, 4. Causes of the incident, whether direct or indirect including equipment, technology, system or management failure, and 5. Measures taken & to be taken to avoid a recurrence of such incident.
SEO	Reporting	Submit an action plan within 14 days, or a shorter period of time, if specified by the Regional Director (DWS).
SEO	Reporting	The action plan must include the following information: 1. A detailed time schedule of measures taken to: 1.1 Correct the impacts resulting from the incident; 1.2 Prevent the incident from causing any further impact; and 1.3 Prevent a recurrence of a similar incident.
Progress reporting		
SEO	Revising	Identify methods for preventing the incident from

	Procedures	re-occurring and revise method statements and/or procedures for implementing as early as possible.
SEO	Training	Conduct either a toolbox talk or environmental awareness training/re-induction to the all employees and include additional mitigations to avoid a re-occurrence. <ul style="list-style-type: none">● Keep the program, including a signed attendance register, in the on-site environmental file.

SPILLAGE ON LAND

ACTION TO BE TAKEN		
Personnel	Responsibility	Action
Employee	Reporting	The person responsible for, or who discovers, a hazardous substance spill must report the incident to their immediate Supervisor.
Supervisor	Reporting	Report the incident to the SEO, HSO and Resident Engineer. <ul style="list-style-type: none"> Note that the SEO will take control of all relevant actions once he/she arrives on the scene.
HSO	Reporting	Report the incident to an Inspector (designated under section 28 of the Occupational Health & Safety Act, 1993) within the prescribed period and manner.
Supervisor / SEO	Initial investigation	Determine the extent of the spill, i.e. its boundaries, by observing for the following: <ul style="list-style-type: none"> Any visual indication of pollution, Any odours or emissions detected, Any indication of the source of pollution, Any sign of damage to the natural system. The Supervisor / SEO should provide lighting if working at night.
Supervisor / SEO	Co-ordination	Sound an alarm/whistle. <ul style="list-style-type: none"> The designated response team consisting of area specific personal and including the environmental leader, will congregate at the spill kit. All other employees who do not have specific duties to perform are to evacuate the affected area to a location designated by the Supervisor / SEO.
Supervisor / SEO	Co-ordination	Minimise the effects of the incident on the environment and persons by removing the source of the spill at least 100m away from the watercourse or cut-off the supply of the spill if the source is not moveable.
Supervisor / ECO	Co-ordination	Contain the spill to a confined area to prevent the spreading of the spilled chemical or substance. <ul style="list-style-type: none"> Use sand bags or construct earth berms. If relevant, close off all storm water drains with absorbent mats. Do not wash the spill with water as it will cause

		the spill to spread.
Supervisor / ECO	Co-ordination	Secure the affected area with danger tape.
HSO	Co-ordination	The site shall not be disturbed and no article or substance may be removed (without the consent of the inspector) if there is or likely to be a death, or if there is a loss of limb or part of a limb. However, action can be taken to prevent a further accident, to remove the injured or dead or rescue persons from danger.
Engineer / SEO / HSO	Decision-making	<p>The Engineer will assess the situation in consultation with the SEO and HSO and act as required.</p> <ul style="list-style-type: none"> ● The risk involved shall be assessed before anyone approaches the scene of the incident. ● The HSO will consult the MSDSs. ● The scale of the spill will dictate whether the spill will be cleaned up by using the on-site spill kit and in the prescribed manner, or by contacting a Spill Clean-Up Service Provider for assistance. ● The SEO will take photographs of the affected area. ● No person shall be allowed to approach a spill unless he/she is equipped with the personal protective clothing.
SEO	Directions	If a Spill Clean-Up Service Provider is used, assist the emergency services by clearly marking the route to be taken to the spill site.

SPILLAGE ON LAND

REMOVAL AND REMEDIATION MEASURES TO BE IMPLEMENTED		
Personnel	Responsibility	Action
SEO	Co-ordination	Remove the contaminated soil to the depth of penetration using a spade or shovel.
SEO	Co-ordination	Temporarily store the contaminant in the designated hazardous waste facility at the construction camp.
SEO	Co-ordination	Contact a licensed hazardous waste service provider to collect and transport the waste to a licensed hazardous waste landfill site.
SEO	Co-ordination	Rehabilitate the area cleared of hazardous waste by replacing the topsoil and planting indigenous plants.
SEO	Monitoring	Immediately follow any known spillage of toxic substances with monitoring of the receiving environment, and public health if necessary.
SEO	Monitoring	Take photographs of the affected area during rehabilitation.

SPILLAGE ON LAND

INTERNAL & EXTERNAL COMMUNICATION PLAN		
Personnel	Responsibility	Action
Employee	Reporting	The person responsible for, or who discovers, a hazardous waste spill must report the incident to their immediate Supervisor.
Supervisor	Reporting	Report the incident to the SEO, HSO and Resident Engineer.
HSO	Reporting	Report the incident to an Inspector (designated under section 28 of the Occupational Health & Safety Act, 1993) within the prescribed period and manner.
SEO	Reporting	Report the incident to the Site Agent and/or Manager and the ECO.
SEO	Reporting	If the spill is too big for the spill kit, contact a Spill Clean-Up Service Provider.
SEO	Reporting	Report the incident to the following authorities. 1. DEA (Director General), 2. SA Police Services, 3. Fire Department, 4. DEA (Provincial Head of Department) or Local Municipality, and 5. Any persons whose health may be affected by the incident.
SEO	Reporting	Provide the following information: 1. The nature of the incident, 2. Any risks posed by the incident to public health, safety & property, 3. the toxicity of substances or by-products released by the incident, and 4. Any steps that should be taken in order to avoid or minimise the effects of the incident on public health and the environment.
ECO / Applicant / Site Agent / RE	Reporting	If the nature of the impact constitutes a gross violation of the EA or any legislation: <ul style="list-style-type: none"> ● The ECO must report the incident to the applicant. ● The applicant must report the incident to the Local Municipality, DEA, and DWS. ● The Site Agent and/or Manager must report the incident to their Environmental Group Manager, Divisional MD and CEO.

		<ul style="list-style-type: none">• The Resident Engineer must report the incident to his Superiors.
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SPILLAGE ON LAND

PRESCRIBED REPORTING PROCEDURE		
Incident recording		
Personnel	Responsibility	Action
SEO	Investigation	Conduct an investigation, including interviews, and record all details of the incident. ● The cause must be investigated.
SEO	Reporting	Complete an Environmental Incident Report and forward it to all key project personnel, with the exception of the Emergency Services.
SEO	Reporting	Within 14 days of the incident, report the incident to the following authorities. 1. DEA (Director General) 2. DEA (Provincial Head of Department), and 3. Local Municipality.
SEO	Reporting	Provide the following information: 1. The nature of the incident, 2. The substances involved and an estimation of the quantity released and their possible acute effect on persons & the environment & data needed to assess these effects, 3. Initial measures to minimise impacts, 4. Causes of the incident, whether direct or indirect including equipment, technology, system or management failure, and 5. Measures taken & to be taken to avoid a recurrence of such incident.
Progress reporting		
SEO	Revising Procedures	Identify methods for preventing the incident from re-occurring and revise method statements and/or procedures for implementing as early as possible.
SEO	Training	Conduct either a toolbox talk or environmental awareness training/re-induction to the employee(s) responsible for the spill and include additional mitigations to avoid a re-occurrence. ● Keep the program, including a signed attendance register, in the on-site environmental file.

FIRE

ACTION TO BE TAKEN		
Personnel	Responsibility	Action
Employee	Reporting	The person who starts or discovers a fire must report the incident to their immediate Supervisor.
Supervisor	Reporting	Report the incident to the SEO, HSO and Resident Engineer. <ul style="list-style-type: none"> ● Note that the SEO will take over co-ordination of all relevant actions once he/she arrives on the scene.
SEO	Reporting	If there is potential for a fire to spread and endanger life, property or the environment, alert the landowner and Fire Department.
Land Owner	Reporting	Alert the owners of adjacent land.
HSO	Reporting	Report the incident to an Inspector (designated under section 28 of the Occupational Health & Safety Act, 1993) within the prescribed period and manner.
Supervisor / SEO	Co-ordination	Sound an alarm/whistle. <ul style="list-style-type: none"> ● The designated response team consisting of area specific personnel and including the environmental leader, will congregate at the fire-fighting equipment. ● All other employees who do not have specific duties to perform are to evacuate the affected area to a location designated by the Supervisor / SEO.
SEO	Directions	Assist the Fire Department by clearly marking the route to be taken to the fire.
SEO	Co-ordination	Extinguish the fire or assist in doing so.
SEO	Co-ordination	Stop the spread of the fire.
SEO	Co-ordination	Provide assistance to a fire protection officer or forest officer in the event that they take control over the fighting of a fire.
HSO	Co-ordination	The site shall not be disturbed and no article or substance may be removed (without the consent of the inspector) if there is or likely to be a death, or if there is a loss of limb or part of a limb. However, action can be taken to prevent a further accident, to remove the injured or dead or rescue persons from danger.

FIRE

REMEDIATION MEASURES TO BE IMPLEMENTED		
Personnel	Responsibility	Action
SEO	Assessment	Immediately follow any fire with an assessment of the effects on the environment, public health, safety and property.
SEO	Search	Search the scorched earth for reptiles and other creatures that can be rehabilitated and saved. <ul style="list-style-type: none"> ● Use only a licensed rehabilitation facility.
SEO	Monitoring	Monitor for signs of erosion after the first few rains and new flush. <ul style="list-style-type: none"> ● Manage erosion resulting from a loss in plant basal or aerial cover. ● Ensure that the control measures are not destructive.
SEO	Managing	No Vehicles or plant are permitted to drive through burnt areas.

FIRE

INTERNAL & EXTERNAL COMMUNICATION PLAN		
Personnel	Responsibility	Action
Employee	Reporting	The person who starts or discovers a fire must report the incident to their immediate Supervisor.
Supervisor	Reporting	Report the incident to the SEO, HSO and Resident Engineer. <ul style="list-style-type: none"> Note that the SEO will take control over all relevant actions once he/she arrives on the scene.
SEO	Reporting	Report the incident to the Site Agent and/or Manager and the ECO.
SEO	Reporting	If there is potential for a fire to spread and endanger life, property or the environment, alert the landowner and Fire Department.
Land Owner	Reporting	Alert the owners of adjacent land.
HSO	Reporting	Report the incident to an Inspector (designated under section 28 of the Occupational Health & Safety Act, 1993) within the prescribed period and manner.
SEO	Reporting	Report the incident to the following authorities. <ol style="list-style-type: none"> DEA (Director General), SA Police Services, Fire Department, DEA (Provincial Head of Department) or Local Municipality, and Any persons whose health may be affected by the incident.
SEO	Reporting	Provide the following information: <ol style="list-style-type: none"> The nature of the incident, Any risks posed by the incident to public health, safety & property, the toxicity of substances or by-products released by the incident, and any steps that should be taken in order to avoid or minimise the effects of the incident on public health and the environment.
ECO / Applicant / Site Agent / RE	Reporting	If the nature of the impact constitutes a gross violation of the EA or any legislation: <ul style="list-style-type: none"> The ECO must report the incident to the applicant. The applicant must report the incident to the Local Municipality, DEA, and DWS. The Site Agent and / or Manager must report the incident to their Environmental Group Manager,

		Divisional MD and CEO. ● The Resident Engineer must report the incident to his Superiors.
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FIRE

PRESCRIBED REPORTING PROCEDURE		
Incident recording		
Personnel	Responsibility	Action
SEO	Investigation	Conduct an investigation, including interviews, and record all details of the incident. ● The cause must be investigated.
SEO	Reporting	Complete an Environmental Incident Report and forward it to all key project personnel, with the exception of the Emergency Services.
SEO	Reporting	Within 14 days of the incident, report the incident to the following authorities. 1. DEA (Director General), 2. DEA (Provincial Head of Department), and 3. Local Municipality.
SEO	Reporting	Provide the following information: 1. The nature of the incident, 2. The substances involved and an estimation of the quantity released and their possible acute effect on persons & the environment & data needed to assess these effects, 3. Initial measures to minimise impacts, 4. Causes of the incident, whether direct or indirect including equipment, technology, system or management failure, and 5. Measures taken & to be taken to avoid a recurrence of such incident.
Progress reporting		
SEO	Revising Procedures	Identify methods for preventing the incident from re-occurring and revise method statements and/or procedures for implementing as early as possible.
SEO	Training	Conduct either a toolbox talk or environmental awareness training/re-induction to the employee(s) responsible for the spill and include additional mitigations to avoid a re-occurrence. ● Keep the program, including a signed attendance register, in the on-site environmental file.

APPENDICES

The following appendices form part of this EMP and must be implemented in accordance with their management measures and mitigations through the life-cycle of the project. They have been compiled as stand-alone documents in accordance with the requirements of the Department and will facilitate their use a Method Statement (MS) during construction and a Standard Operating Procedure (SOP) during operation.

Appendix 1 - Alien invasive management plan

Appendix 2 - Plant rescue and protection plan

Appendix 3 - Avifauna monitoring and management plan

Appendix 4 - Re-vegetation and habitat rehabilitation plan

Appendix 5 - Traffic management plan

Appendix 6 – Water & Erosion management plan, including storm water

Appendix 7 – Fire Management Plan

APPENDIX 1 - ALIEN INVASIVE MANAGEMENT PLAN

APPENDIX 2 - PLANT RESCUE AND PROTECTION PLAN

APPENDIX 3 - AVIFAUNA MONITORING AND MANAGEMENT PLAN

APPENDIX 4 - RE-VEGETATION AND HABITAT REHABILITATION PLAN

REVEGETATION & HABITAT REHABILITATION PLAN (Cape Lowlands Environmental Services, 2012)

CONSTRUCTION PHASE

Various construction activities, such as establishing construction camp and waste collection area, construction of access roads, clear & grub activities and levelling could cause environmental damages leading to erosion. These environmental damages include disruption and disturbance of protected / endangered vegetation, damage to topsoil and compacting of ground.

In order to ensure reversal of the abovementioned impacts, the environment will be rehabilitated. Rehabilitation will occur subsequent to completion of construction & during decommissioning. Throughout the construction phase the management and mitigation measures prescribed in Table 24 must also be implemented. This will ensure not only that the environment is minimally damaged, but also that rehabilitation activities will be more effective.

- The Contractor shall take all appropriate and active measures to prevent erosion, especially wind and water erosion, during the rehabilitation of the construction phase. Any erosion caused on site during the construction phase as a result of runoff needs to be rehabilitated;
- Temporary erosion protection measures must be kept in place until permanent preventative measures (such as establishment of vegetation) is concluded;
- Areas where disturbance and loss of topsoil, scarring of the soil surface and land features have occurred (such as at the construction camp) must be filled with rehabilitated topsoil;
 - Topsoil removed during construction must be conserved and stockpiled (no more than 2 m in height) for rehabilitation use; and
 - All spills must be removed and disposed of at an approved dumping site and rehabilitated immediately.
- Compacted ground shall be rehabilitated by ripping to a minimum depth of 600mm;
 - Ripping will increase the soil's water storage capacity;
 - Stop soil erosion;
 - Alleviate the re-compaction; and
 - Allow deep root growth and water infiltration.
- Topsoil of at least 20 cm should be placed on top of the ripped soil. Following topsoil, the affected area should be re-vegetated;
- Areas prone to erosion caused by the removal of vegetation (such as around the bases of the panel foot pieces) must be rehabilitated with topsoil and the area re-vegetated:
 - Re-vegetation must include the use of only indigenous vegetation and plants similar to that of the natural surrounding areas;

- A Contractor appointed by the developer and Engineer shall be tasked to ensure that all weeds and alien & invasive species are removed as instructed and approved by the ECO;
- No on-site burying, dumping or stockpiling of any weeds and aliens or invasive species may occur. Such should be removed from the site to a suitable dumping site from which seed cannot escape;
- Site rehabilitation requires a well- designed planting program to be developed prior to re-vegetation; and
- No construction equipment, vehicles or unauthorised personnel shall be allowed onto areas that have been re-vegetated.
- There must be no vegetation interfering with structures and statutory safety requirements upon completion of the contract;
- On completion of works, the contractor shall clear away and remove from the site all construction paint, surplus materials, foundations, plumbing and other fixtures, rubbish and temporary works of every kind.
- The construction sites shall be cleared, and cleaned to the satisfaction of the Developer and the ECO; and perimeter fencing must be removed at the end of construction in order to ensure that they do not deteriorate and result in an aesthetically unpleasing development.

Topsoil removed during the construction phase should not be stockpiled for use during the decommissioning phase, as the end of life of operations is unknown at this stage. Should topsoil be stored indefinitely, it will lose viability. All topsoil must thus be used during construction phase rehabilitation.

OPERATIONAL PHASE

No rehabilitation will be necessary during this phase. Refer to maintenance procedure above.

DECOMMISSIONING PHASE

Decommissioning of this development is not foreseen in the near future. Due to the changes in technology anticipated to occur, decommissioning phase specific rehabilitation measures will not be provided at this stage.

Prior to undertaking any decommissioning activities, impacts will be determined and management, mitigation and rehabilitation measures determined. A rehabilitation plan will also be developed prior to undertaking any decommissioning activities.

APPENDIX 5 - TRAFFIC MANAGEMENT PLAN

APPENDIX 6 – WATER & EROSION MANAGEMENT PLAN, INCLUDING STORM WATER

APPENDIX 7 – FIRE MANAGEMENT PLAN