

Environmental Management Programme:

The establishment of a 75MW solar farm on the farm Grootspruit 252/0, Odendaalsrus RD, Free State Province, South Africa

January 2014

DEA Ref. Nr. 14/12/16/3/3/2/376

NEAS Ref. Nr. DEA/EIA/0001322/2012

Prepared for:



Solairedirect Southern Africa (Pty) Ltd
Reggie Niemand (Project developer)
Postnet Suite 307, Private Bag X18
Rondebosch, 7701
082 674 1233 (Mobile)
021 685 9377 (Tel)
021 685 9591 (Fax)
niemand@solairedirect.co.za

Prepared by **H2ON** Environmental Specialists



General information:

Postal Address: Suite 158, Private Bag X01, BRANDHOF, 9324
 Physical Address: 21 Dromedarisstreet, Dan Pienaar, BLOEMFONTEIN
 Telephone: 051 4444700
 Fax No: 0866973660
 E-mail: gys@h2on.co.za

Background

H2ON Environmental Specialists is a Bloemfontein based company with expertise in specific environmental fields but also in the coordination of larger environmental management project that involves outside contracted expertise for specialist investigations.

We provide our clients with a professional service and cost effective solutions to their environmental problems to conduct their activities, development or explore natural resources like minerals, surface and ground water, without negatively impacting on the environment.

H2ON endeavours to provide a high quality service and prompt completion of deliverables

Fields of Expertise:

Environmental management	Bio monitoring
ISO14001 implementation and auditing	Pollution control
Water use licence applications	Solid waste management
Environmental impact assessments	Geological and geohydrological investigations
Environmental auditing	Heritage Impact Assessments
Mining authorization application	Botanical Surveys
Catchment Management	Rehabilitation
Water Quality Assessments	Ground- and surface water monitoring programs
Development and management of	

Professional Team:		
<i>Name</i>	<i>Qualification</i>	Specialist field
Gys Hoon	B Sc, Geochemistry and Geology 1988 B.Sc Honors in Geohydrology 1989 Professional Standing: Registered as a professional scientist: Pr.Sci.Nat 4 00004/93 SAATCA Registered ISO 14001 environmental management systems auditor: E061	Mining authorization applications ISO 14001:2004, audits, training and implementation Water use right applications Environmental Impact Assessments Groundwater investigations Environmental audits Water quality investigations Catchment management Development of environmental monitoring systems Environmental risk assessments Waste Management Application for mining authorization, water use authorizations and waste Disposal permits
Darius van Rensburg	2007- B.Sc spes Botany and Zoology 2008 – B.Sc Honors in Botany 2012 – M.Sc. in plant ecology	Ecological Assessments Biodiversity Analysis Environmental Impact Assessments Vegetation Assessments Riparian Vegetation Succulent Vegetation

Refer to Annexure 5 for the expertise of the professional team who prepared this Environmental Management Programme (EMP).

TABLE OF CONTENTS

BRIEF DESCRIPTION	6
1. Contact details	6
1.1. Name and address of the applicant.....	6
1.2. Name and address of the surface owner.....	6
1.3. Name and address of the Environmental Assessment Practitioner.....	6
2. The property	7
3. Scope of the project:	8
4. OBJECTIVES OF THE ENVIRONMENTAL MANAGEMENT PLAN	9
5. RESPONSIBILITIES.....	10
5.1. The Applicant	10
5.2. The Environmental Control Officer (ECO).....	10
5.3. The Contractor	10
5.4. Responsibility / Objectives: Planning and Construction Phase	11
5.5. Responsibility / Objectives: Operational Phase.....	10
5.6. Responsibility / objectives: Decommissioning Phase.....	10
5.7. Objectives: Rehabilitation activities	10
6. ENVIRONMENTAL MANAGEMENT PROGRAM	12
6.1. Design Phase.....	12
6.2. Construction Phase.....	13
6.2.1. Site establishment	13
<i>Demarcation of the site</i>	<i>13</i>
<i>Provision of services to the work force.....</i>	<i>14</i>
<i>Protection of plant and animal life</i>	<i>14</i>
<i>Protection of the cultural historical aspects.....</i>	<i>16</i>
6.2.2. Site infrastructure	16
<i>Laydown area</i>	<i>16</i>
<i>Access Roads.....</i>	<i>16</i>
6.2.3. Site management	17
<i>Excavated Construction Material</i>	<i>17</i>
<i>Solid waste.....</i>	<i>18</i>
<i>Liquid waste.....</i>	<i>18</i>
<i>Hazardous waste</i>	<i>19</i>
<i>Pollution control</i>	<i>19</i>
<i>Implements and equipment.....</i>	<i>20</i>
<i>Air quality and Noise control</i>	<i>20</i>
<i>Visual Impact</i>	<i>21</i>
<i>Fire control.....</i>	<i>21</i>
<i>Hazardous substances</i>	<i>22</i>
6.2.4. Erosion control.....	22
<i>Surface water management.....</i>	<i>22</i>
<i>Erosion protection</i>	<i>23</i>
<i>Erosion remediation</i>	<i>23</i>
<i>Topsoil management</i>	<i>23</i>

6.2.5.	Control of alien plants.....	24
6.2.6.	Rehabilitation of the construction site	24
	<i>Removal of structures and infrastructure</i>	<i>24</i>
	<i>Inert waste and rubble</i>	<i>25</i>
	<i>Rehabilitation of work areas and access roads.....</i>	<i>25</i>
6.3.	Maintanance and operation phase	26
6.3.1.	Protection of vegetation and natural features	26
6.3.2.	Access Road	27
6.3.3.	Maintenance of Solar Panels and Infrstructure.....	27
6.3.4.	Site Management	28
	<i>Solid waste.....</i>	<i>28</i>
	<i>Liquid waste.....</i>	<i>28</i>
	<i>Hazardous waste</i>	<i>28</i>
	<i>Pollution control</i>	<i>29</i>
	<i>Implements and equipment.....</i>	<i>29</i>
	<i>Air quality and Noise control</i>	<i>29</i>
	<i>Visual Impact</i>	<i>30</i>
	<i>Fire control.....</i>	<i>30</i>
	<i>Hazardous substances</i>	<i>30</i>
6.3.5.	Erosion management	31
6.4.	Decommissioning- and Closure Phase	32
7.	ENVIRONMENTAL MONITORING AND AUDITING.....	34

Appendix A:

Table 1: A table indicating the Responsible Person, Performance Indicators as well as the Time Frame for Implementation of Mitigation Measures

Appendix B:

Workforce Induction

BRIEF DESCRIPTION

1. CONTACT DETAILS

1.1 The Applicant

Name: Solairedirect Southern Africa (Pty) Ltd
Registration Nr: 2009/010518/07
Postal address: Postnet Suite 307, Private Bag X18, Rondebosch, 7701
Contact person: Reggie Niemand (Project developer)
Tel. Nr: 021 685 9377
Cel. Nr: 082 674 1233
Fax Nr: 021 685 9591
E-mail: rniemand@solairedirect.co.za

1.2 Name and address of the property owner

Name: GrootspruitFamilie Trust
Registration Nr: TMP 2471
Postal address: P.O.Box 226, Bothaville, 9660
Contact person: Tertius de Jager
Tel. Nr: 056 515 1658
Cel. Nr: 082 902 4870
Fax Nr: 086 550 1827
E-mail: tertiusdj@lantic.net

1.3 Name and address of the Environmental Assessment Practitioner

Name: H2ON Environmental Specialists
Postal Address: Suite 158, Private Bag X01, Brandhof, 9324

Contact person: Darius van Rensburg

Tel. Nr: 051 444 4700

Fax Nr: 086 697 6132

E-mail: darius@h2on.co.za

Refer to Annexure 5 for the expertise of the EAP.

2. **PROPERTY DESCRIPTION (See locality map)**

Farm name and number: Grootspuit 252/0

Farm portion: Remainder

Area: 689.7224 ha

Title deed: T22485/1879

Surveyor General Code: F0240000000025200000

Province: Free State Province

District Municipality: Lejweleputswa

Local Municipality: Matjhabeng

GPS Coordinates: S 27.733885° E 26.768302°



Figure 1: Locality of the site and property. The nearest town, Allanridge, is indicated in the lower left corner.

3. SCOPE OF THE PROJECT

The proposed Grootspuit Solar Farm Project is a project proposal that will include the development of a Photo Voltaic solar farm and related infrastructure to the extent of 180 ha which will include the following (refer to map 4 in **Annexure 2**):

- Solar panels will consist of Photo-Voltaic cells placed on aluminium structures. These panels will be mounted on fixed mounting structures. The height of these panels and mounting structures are 3.4m.
- Inverter/Transformer enclosures (21m² area)
- Grid connection substation (convert 22kV to 132kV)
- Connection to Eskom power grid by means of two 132kV overhead power lines. The electricity produced will be fed into the Eskom grid via the Grootkop-Kutlwanong power line on the site.
- Guard house (26m² area).

Excavation of the topsoil will only take place where cables are inserted as well as areas where foundations will be excavated for the construction of the guardhouse, inverters and substation.

The existing farm dirt roads will be utilised to gain access to the site. However, this access road will be upgraded to ensure access of construction vehicles to the proposed site.

General waste will be generated by the construction crew during the construction phase of the development as well as a limited amount of waste during the operational phase. This waste will be collected in containers and removed on a weekly basis to the nearest authorised landfill site (Allanridge/Odendaalsrus).

During construction sewage will be managed by on-site chemical toilets. During the Operational Phase the sewage generated will be managed by the use of a composting toilet which makes use of an aerobic process to treat human waste material. The system would not utilise water for the functioning and would therefore not produce any effluent.

During the Construction Phase water will be used for human consumption by the construction crew, dust control, moisture conditioning of roads and foundations for compaction. It is estimated that these activities will utilise an amount of 4 800 000 litres during the construction phase. During the operational phase the facility will use an approximate amount of 750 000 litres per year. This amount of water will be utilised for the cleaning of the Photo Voltaic solar panels.

The facility will utilise limited electricity for operational activities on the site. This electricity will be sourced directly from the power produced by the plant. The facility will produce electricity for Eskom to the amount of 75 MW. This electricity produced will be fed into the Eskom grid via the Grootkop-Kutlwanong power line on the property concerned.

4. OBJECTIVES OF THE ENVIRONMENTAL MANAGEMENT PLAN

The objective of this EMP is to guide and manage the activities that relates to the construction and operation of the proposed Solar Farm on the remainder of the farm Grootspuit 252 to protect the receiving environment from unnecessary impacts. The report is considered to be a living document and will be updated or amended as information become available during the monitoring of activities and environmental parameters.

The Environmental Management Programme Report (EMPR) is intended to provide environmental specifications for the construction of a Solar farm to put measures in place to mitigate and manage potential environmental impacts arising from all the phases (especially considering the construction and the operation) of the solar farm.

5. RESPONSIBILITIES

5.1 The Applicant

- The applicant is responsible for the implementation of the conditions in the EMP
- A responsible and suitably qualified person (Environmental Control Officer) must be appointed during the construction and operational phases to ensure that the contractor complies with the requirements in the EMP.
- During the operation phase the applicant must ensure that the relevant environmental biomonitoring is undertaken and that sufficient record is kept of this.

5.2 The Environmental Control Officer (ECO)

- Ensure that the EMP is implemented by the Contractor during the constructions phase and monitor all activities.
- Ensure that all employees, including the contractor on site are familiar with all the conditions and requirements in the EMP.
- Ensure that access routes and work areas are demarcated where activities will take place and also “no-go” areas.
- Communicate any information that relates to the management of environmental aspects or any change of the EMP conditions to the contractor and the applicant.
- Address any complaints from the public or official from a regulating authority appropriately and inform the applicant.
- Keep record of any complaints received: date, name, complaint and response.
- Keep a record of any non-compliance to the EMP: date, description and corrective actions.
- Report any non-compliance or incident that may have a significant impact on the environment or adjacent annual stream, to Department of Environmental Affairs and the Department of Water Affairs.

5.3 The Contractor

- The contractor must be contractually bound to comply with all the conditions of the EMP
- The contractor must consult with the environmental coordinator with any matter on environmental issues

- Report any incident that may have an impact on the environment or a non-compliance of any EMP conditions to the environmental coordinator.

5.4 Responsibility / Objectives: Planning and Construction Phase

- Protect the environment on the site, i.e. 180 ha of undeveloped land on the farm Grootspuit 252/0, Odendaalsrus RD.
- Ensure controlled access to the site to prevent degradation.
- Be held responsible to have a copy of the EMPR, Environmental Authorisation and Environmental Impact Report (EIR) available on site at all times.
- Be held responsible for the implementation of the EMPR, EIR and compliance with any conditions as stipulated in the Environmental Authorisation.
- Implementation of management measures in order to limit and / or prevent any potential environmental impacts.
- Ensure compliance to best practices and the requirements of the EMPR.
- It is recommended that an environmental compliance audit be undertaken during the Construction Phase and / or after construction activities have ceased to verify compliance with the EMPR and Environmental Authorisation.
- Ensure that all problems identified during any environmental audits or inspections, are addressed and rectified as soon as reasonably possible.
- To have the results of any environmental audits available in writing, together with a report on action taken to rectify any identified environmental issues.

5.5 Responsibility / Objectives: Operational Phase

- The applicant will be responsible to prevent negative environmental impacts and will be responsible for the following:
- Providing a budget for maintenance of infrastructure.
- Maintaining all approved infrastructure in good working order to effectively fulfil its intended purpose to prevent negative environmental impacts.
- Not construct any additional buildings, infrastructure, etc. without investigating the potential necessity to perform an Environmental Impact Assessment in terms with the NEMA Regulations of 2010.

- To immediately remedy any factors that contribute to negative environmental impacts.

5.6 Responsibility / objectives: Decommissioning Phase

At present, it is not anticipated that the project will undergo decommissioning and / or Closure. However, should it be decided to demolish any infrastructure that will be associated with the proposed development, the site will be rehabilitated to its original state as far as practicable possible, depending on the end land use to be decided upon at the time. A Rehabilitation Plan will be submitted to the Free State Department of Economic Development, Tourism and Environmental Affairs (DETEA) as well as the National Department of Environmental Affairs (DEA) for approval prior to commencement of any rehabilitation activities.

5.7 Objectives: Rehabilitation activities

Rehabilitation of areas disturbed during construction and management / mitigation measures will be undertaken throughout all the phases of the project. The most important objective regarding the measures during rehabilitation will be to limit any environmental impacts to the surrounding environment and potential affected parties as far as possible.

6. ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPR)

6.1 Design Phase

The proposed project will be undertaken on 180 ha of the farm Grootspuit 252/0, Odendaalsrus RD.

- A copy of the layout plan must be available at the site for scrutiny during construction when required.
- All activities related to the construction of the solar facility must be limited to the boundaries indicated as such on the site layout plan.
- The construction laydown area must be situated as indicated by the final layout plans. This area should also be approved by the Environmental Control Officer (ECO) and should be subject to regular inspections.
- After construction the temporary laydown area must be rehabilitated to its initial state. If the laydown area was situated on natural vegetation the area will be rehabilitated by ripping and re-seeding.

- A survey must be conducted prior to construction by an ecological specialist to ascertain if any specimens or colonies of the endangered Sungazer Lizard (*Cordylus giganteus*) (VU) are present on the site or the immediate surroundings.
- A representative from Endangered Wildlife Trust (EWT) and the Sungazer Working Group (SWG) must be contacted and involved during the survey and all consequent phases following upon this.
- Should re-location be required a research phase must precede this within which EWT and SWG must conduct research regarding the best methods for re-location. The timeframe for this research phase must be agreed upon by EWT and SolaireDirect Southern Africa (Pty) Ltd.
- If the above survey has established that the species is present a search-and-rescue operation must be initiated whereby all specimens located on the site must be removed and re-located to an area on the property with a similar habitat as the area where they were originally found. The search-and-rescue operation must be led by a qualified ecologist.
- The re-location of any possible Sungazer Lizards may not occur without the possession of a permit from the relevant authorities.
- If the endangered Sungazer Lizard (*Cordylus giganteus*) is re-located a monitoring program must be initiated. The monitoring program must be conducted by a qualified ecologist. Monitoring must take place daily during the first two weeks of re-location and weekly thereafter for the duration of the construction phase.

6.2 Construction Phase

6.2.1 Site Establishment

Demarcation of the site

- Identify and demarcate the extent of the construction site as indicated by the layout plan.
- The seasonal stream and other small wetlands in the area must be excluded from the construction area. A buffer zone of 30 meters from the edge of this seasonal stream must be respected and this buffer zone should be demarcated, protected and should be considered a “no-go” area.
- Do not establish any activities or operations that, in the opinion of the ECO are likely to adversely affect the aesthetic quality of the environment.

- Do not paint or mark any natural feature. Marking for surveying and other purposes must be done using pegs, beacons or rope and droppers.
- The construction site and laydown area may not be cleared of vegetation and no grading of vegetation must take place.
- No water may be abstracted from the seasonal stream or any other wetland on the property.

Provision of services to the workforce

- Site establishment must take place in an orderly fashion and all required amenities must be installed prior to the arrival of the main workforce.
- Potable drinking water must be available at the site office and other convenient locations on the site. Water used must be taken from a legal source and must comply with the standards for potable water.
- Ample chemical toilets must be placed on the site for use by the workforce. These toilets must be maintained and cleaned regularly and kept in a sanitary order.

Protection of plant and animal life

- All activities must be limited to the identified work areas and access roads.
- No hunting, capturing or harming of any faunal species on the site must be allowed.
- No open fires are permitted.
- The vegetation on the construction site must not be removed on the site.
- Removal of vegetation must be restricted to excavation of trenches for installation of cables as well as the construction of a substation, inverters, guardhouse and other buildings.
- Construction must be limited to the demarcated construction area.
- Solar panel frames must be anchored by means of anchor screws which have the least impact on the soil surface and vegetation.
- A portion of the dwarf succulent (*Nananthusvittatus*) population should be kept intact. During construction, areas in between panels where this species occurs in high density should be demarcated and no construction should be allowed in these areas (see visual representation in Figure 2). This will keep a portion of the population intact. This demarcation should be ongoing throughout the construction phase and should be led by the ECO.
- A portion of the Trapdoor Spider (*Stasimopus spp.*) population should be kept intact. During construction, areas in between panels where Trapdoor Spiders occur in high density should be

demarcated and no construction should be allowed in these areas (see visual representation in Figure 2). This will keep a portion of the population intact. This demarcation should be ongoing throughout the construction phase and should be led by the ECO.

- A permit must be acquired for the destruction of any portion of the protected Trapdoor Spider population.
- None of the burrows on the site must be filled in. Burrows must be identified and demarcated prior to construction and left intact during the initial 6 months of construction. This will allow the mammalian occupants to vacate the area. This process must be led and monitored by the ECO.
- The colony of protected Suricate (*Suricatasuricata*) (S 27.73647° E 26.77241°) must be demarcated prior to construction and no construction must be allowed within the area for 6 months during the initial construction. This will allow the colony ample time to vacate the area. An inspection must be done prior to construction by the ECO to ascertain if the colony is still present. Inspections must be done regularly to establish when the colony has vacated the area.
- The fence surrounding the facility must allow for small mammals to enter the area, this will ensure that the area remains as available habitat for several species. Openings of 30cm x 30cm should be sufficient to allow passage to small mammals.
- The facility must maintain a 30meter buffer from the annual stream and small wetlands on the property. This will mitigate the impact on water fowl and amphibians in the area.
- Bird flappers must be attached where overhead power lines are to be constructed.
- The placement of the proposed new section of power line should be such that the impact on bird life is kept to a minimum.
- Removal of nests should only take place during the winter months when limited breeding of birds takes place.
- The installation of artificial nest sites should be considered. These nests should be placed on elevated structures away from the surrounding power lines. The perimeter fence or surrounding trees should be considered for these artificial nests. The nests should cater for owls (boxes) as well as raptors (platforms).
- If specimens of the endangered Sungazer Lizard (*Cordylusgiganteus*) were identified and re-located during the design phase monitoring of these populations should continue as stipulated under **6.1 Design Phase**.
- No illegal collecting of any possible Sungazer Lizards may be permitted.

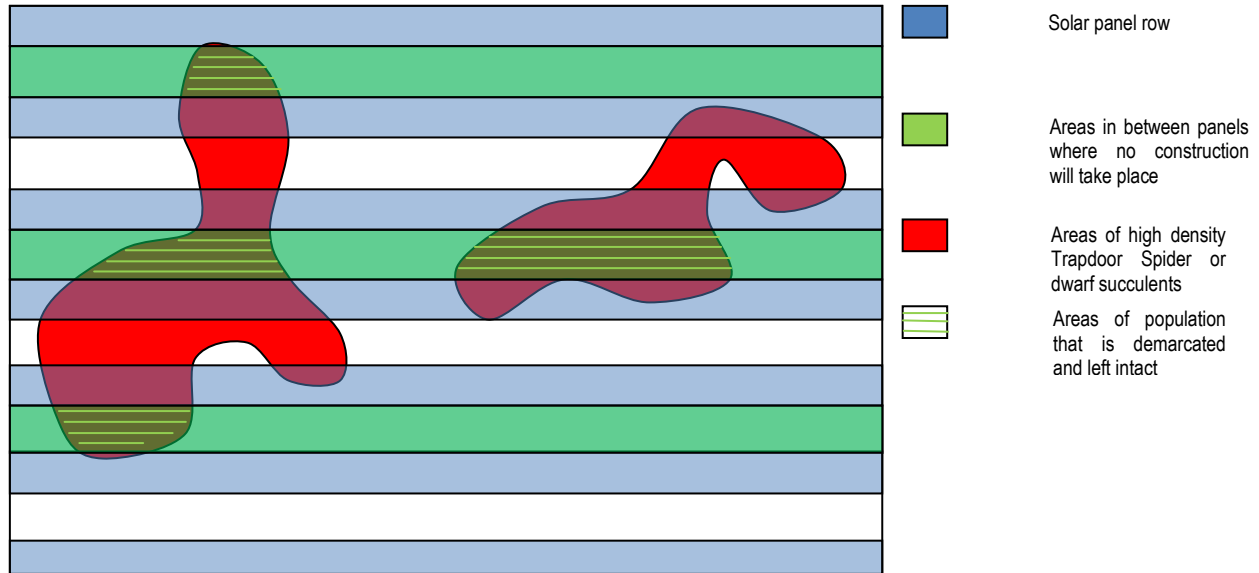


Figure 2: Visual illustration of the areas of high density Trapdoor Spider (*Stasimopus sp.*) and dwarf succulent (*Nananthusvittatus*) and the mitigation measure that will ensure a portion of the population remains intact.

Protection of cultural historical aspects

- Should any objects of archaeological remains, graves or skeletal material be found during construction activities, work must immediately stop in that area and the ECO must be informed.
- The ECO must inform the South African Heritage Recourse Agency (SAHRA).
- No work may be resumed in this area without the permission from the ECO and SAHRA.
- The two grave sites on the property should be demarcated and no activities of any sort may occur around these gravesites. Although the gravesites are not located within the layout of the facility they are nonetheless considered sensitive areas. The locations of the gravesites are: S 27° 43' 43.9" E 26° 46' 13.8" and S 27° 44' 44.1" E 26° 47' 06.9".

6.2.2 Site infrastructure

Laydown area

- The temporary construction laydown area shall be located as indicated by the layout plan and shall not exceed 4 800 m² as indicated by the layout plan.
- The temporary construction laydown area must contain all relevant infrastructure necessary for construction such as the chemical toilets, site offices, access control and changing rooms.

- All storage of construction materials should take place within this laydown area. If this area is not large enough for storage an area around the existing farmstead that is already disturbed should be identified by the ECO for the storage of construction materials (the farmstead is not currently inhabited).
- Any additional storage areas required besides the temporary construction laydown area as indicated by the layout plan should be approved by the ECO.
- Clearly indicate which activities are to take place within which areas of the site.
- The laydown area must be fenced or suitably secured.

Access Roads

- Access roads to the site must be clearly demarcated.
- The existing dirt roads on the property should be utilised for access to the site as indicated on the layout plan.
- The existing access road may be upgraded to a width of 6m but no wider. The width of 6m will include the reserve. The design and upgrading must be determined in accordance with SABS standards and South African requirements (e.g. compacted road layer works and crushed stone surfacing).
- A perimeter road around the site may be constructed. This perimeter road will also act as a firebreak. This perimeter road will have a width of 5m but no wider. The width of 5m will include the reserve.
- Ensure that adequate vehicle turning areas are allowed for.
- Any additional routes and turning circles required must be approved by the ECO.
- Enforce speed limits at all times, both on public roads and on site roads. Unless otherwise specified by the ECO the speed limit on construction roads is 30km/h. This will prevent dangerous conditions, excessive dust or excessive deterioration of the road being used.
- Ensure that only authorised roads and access routes are used.
- Vehicles may not leave the designated roads or pull off these roads.
- No off-road driving is permitted.
- Runoff from roads must be managed to avoid erosion and pollution problems. Adequate drainage and erosion protection in the form of side drains, cut-off berms or trenches must be provided where necessary.

- Maintain all access roads adequately in order to minimise erosion and undue surface damage. Repair rutting and potholing.
- Clear up any gravel or cement spillage on roads.
- Clean and make good any damage to public roads in use.
- Regularly remove topsoil (and other material) accumulated in side drains of roadways to keep these open and functional.
- Maintenance of dirt roads must include the public dirt roads (such as the S940) that are utilised to transport construction materials to the site.

6.2.3 Site management

Excavated Construction Material

It is not foreseen that the development will require the excavation of earth materials (e.g. crushed rock, sand, etc.) during the construction phase. However, should it become apparent that the development will require the import of earth materials these must only be sourced from a licensed borrow pit. No excavation of earth materials may occur on the property for the purpose of construction.

Solid Waste

- Suitable covered receptacles shall be available at all times and conveniently placed for disposal of waste. All receptacles should be suitably covered.
- Waste must regularly be removed and disposed of at an authorised disposal facility (Allanridge/Odendaalsrus).
- No solid waste may be burned on site.
- No solid waste may be buried on site.
- Minimise waste by sorting recyclable and non-recyclable wastes.
- Any construction solid waste generated during the Construction Phase will be removed from site and disposed of at an authorised landfill site (Allanridge/Odendaalsrus).
- Any recyclable waste (e.g. scrap metal) generated during construction will be sold to a third party for recycling.

Liquid Wastes

- Provide portable chemical toilets at the work sites.

- Do not locate any site toilet, sanitary convenience, septic tank or French drain within the 1:100 year floodline, or within a horizontal distance of 100m of the river.
- Maintain and clean site toilets regularly as is required to keep them in an acceptable state of hygiene (proof thereof must be made available on request).
- The sewage waste from these chemical toilets must be disposed of at a Waste Water Treatment Works (WWTW) in the nearest town.
- Polluted runoff water must be isolated and not be allowed to enter drainage lines, seasonal stream, wetlands or storm water canals.
- Provide containment and settlement ponds for effluent from concrete mixing and washing (concrete vehicle wash bay) facilities.

Hazardous Waste

- Ensure compliance with all national, regional and local legislation with regard to the disposal of hydrocarbons, chemicals, solvents and any other harmful and hazardous substances and materials.
- Collect any hazardous waste in clearly marked receptacles located on a drip tray on site pending disposal. All receptacles should be suitably covered.
- All spills should be cleaned up immediately by removing the spillage together with the polluted soil and be disposed of as hazardous waste.
- Retain waste oils and batteries for recycling by the supplier wherever possible.
- Regularly dispose of all hazardous not earmarked for reuse, recycling or resale (such as oil contaminated with chlorinated hydrocarbons, electrical cleaning solvent, certain chemicals and fluorescent tubes) at a registered hazardous waste disposal site.
- Contain chemical spills, and arrange for cleanup by the supplier, or by professional pollution control personnel.

Pollution Control

- Ensure that no storm water is allowed to enter storage areas.
- Ensure that water passing through wash bays and workshops pass through oil baffles/oil traps/oil separators before passing into conservancy tanks.
- Treat all oil sludge collected in the traps, including sump liners, as hazardous waste.

- Take special care during rainy periods to prevent the contents of sumps and drip trays from overflowing.
- Immediately clean any accidental oil or fuel spills or leakages.
- Report major spills to the provincial Department of Water Affairs, as well as to the relevant Local Authority.
- Carefully control all on-site operations that involve the use of cement and concrete.
- Limit cement and concrete mixing to single sites as far as possible.
- Use plastic trays or liners when mixing cement and concrete: Don not mix cement and concrete directly on the ground.
- Dispose of all visible remains of excess cement and concrete after the completion of tasks. Dispose of cement and concrete waste in the approved manner (solid waste concrete may be treated as inert construction rubble).
- Spill kits must be available on site and in all vehicles that transport hydrocarbons. Spill kits must be made up of material/product that is in line with environmental best practise (SUNSORB is a recommended product that is environmentally friendly).

Implements and Equipment

- Make use of plant and equipment which is appropriate to the task in order to minimise the impact on and extent of damage to the environment.
- Should the ECO at any time determine that the method, plant or equipment utilised by the contractor is unsuitable for the task at hand, or unnecessarily detrimental to the environment, then he may specify the use of a suitable alternative.
- All equipment on site must be inspected for diesel/oil leaks prior to operation.
- Leakages must be repaired as soon as possible and drip trays must be placed underneath machinery until such leakages have been repaired.

Air quality and Noise control

- The liberation of dust into the surrounding environment shall be effectively controlled by the use of, *inter alia*, water spraying and/or other dust-allaying agents.

- The speed of trucks and other vehicles must be strictly controlled and a speed limit of 40km/h should be maintained on the gravel road from the turnoff to the Grootspuit 252/0 farm to avoid dangerous conditions, excessive dust or excessive deterioration of the road being used.
- Unless otherwise specified normal work hours will apply (i.e. from 07h00 to 17h00, Mondays to Fridays).
- If noise levels at the boundaries of the site exceed 7dB above ambient levels, then the local health authorities are to be informed.
- Notify adjacent landowners of after-hours construction work and of any other activity that could cause a nuisance.
- Fit silencers to all construction vehicles.

Visual Impact

- The vegetation on the site should be allowed to re-establish after construction. This will soften the visual impact that the facility will have. Should re-vegetation not be deemed adequate a hydro-seeding program should be implemented.
- A visual buffer of 500m but preferably 1000m from the surrounding dirt roads should be respected from the border of the development. This will considerably mitigate the visual impact of the facility.
- Cables should be placed underground as far as possible. Cables from the panels should be fastened to the mounting structure.
- The design of any buildings associated with the facility (e.g. guardhouse) should fit the design of the surrounding rural buildings.
- Signs associated with the facility should be restricted to the entrance gates. No billboards should be allowed on the site or adjacent to the dirt roads.
- External lighting should be carefully chosen to minimise the visual impact associated with artificial lighting. Aspects that should be investigated include the height of the lighting fixtures, fitting of reflectors to avoid light spillage, directing and shielding lighting away from the surroundings and using designs that minimise the upward scattering of light. The lighting on the facility should not exceed the minimum required for safety and security.
- The construction camp and laydown area should be situated as far away as possible from the surrounding public dirt roads.

- The management of building rubble and other wastes associated with the construction and operation of the facility should comply with best practise and should be removed from the site.
- Use materials, coatings and paint that do not reflect.

Fire Control

- Take adequate precautions to ensure that fires are not started as a result of works on site.
- The Contractor will be held liable for any damage to property adjoining the site as a result of any fire caused by one of his employees.
- No open fires are permitted anywhere on site.
- Construct a perimeter road around the facility that will act as a fire break. This road must not exceed a width of 5m and must be maintained regularly.
- Ensure that fire fighting equipment is kept on site at all times. This equipment must include fire beaters and fire extinguishers.
- Take immediate steps to extinguish any fire which may break out on the construction site.
- Do not store any fuel or chemicals under trees.
- Do not store gas and liquid in the same storage area.
- Do not permit smoking within 3m of any fuel or chemical storage area or refuelling area.

Hazardous substances

- Ensure compliance with all national, regional and local legislation with regard to the storage, transport and use of hydrocarbons, chemicals, solvents and any other harmful and hazardous substances and materials.
- Keep a record of all hazardous substances stored on the site for submission to the ECO.
- Hazardous substances such as diesel, oil etc. must be stored in dedicated areas developed to minimise spills. All storage areas, spillage containment areas, containers of hazardous substances and dangerous equipment must be clearly labelled as such.
- All hazardous substance storage tanks must be erected inside a concrete bund wall with sufficient capacity to contain 110% of the volume of the contents of a full tank. The bund wall system must be impenetrable and be in accordance with SANS 10089:1.
- All banded areas must be underlain by a concrete slab or liner, sloped toward a sump for spillage removal.

- Treat spills within the bund and the contents of the sump as hazardous waste.
- All hazardous substances storage tanks must be so located as to pose the least risk to environmental pollution, i.e. the tanks must be placed above the 1:100 year floodline of the seasonal stream.
- Empty containers in which hazardous substances were kept are to be treated as hazardous waste.

6.2.4 Erosion Control

Surface Water Management

- Avoid over-wetting, saturation and unnecessary runoff during dust control activities.
- Do not allow surface water or storm water to be concentrated or to flow along cable trenches without erosion protection measures being in place.

Erosion Protection

- Protect all areas susceptible to erosion on site.
- Do not permit vehicular or pedestrian access into natural areas beyond the demarcated boundary of the construction area.
- The vegetation on the construction site will not be removed during construction.
- Removal of vegetation will be restricted to excavation of trenches for installation of cables as well as the construction of a substation and inverters.
- Solar panels must be anchored by means of anchor screws which do not necessitate the removal of topsoil and will lead to the least disturbance of the soil surface.
- Earthworks will be limited to the construction of the substation, guardhouse and other buildings.
- Surface structures such as swales and berms must be implemented to prevent erosion; the use of attenuation ponds must also be investigated.
- Use geotextiles where appropriate for the prevention of erosion.
- Levelling of the site will not be done; the topography of the site will be kept intact.
- Areas prone to damming and problematic storm water flow areas should be addressed by the implementation of appropriate storm water control measures to ensure a free draining surface to prevent ponding of surface water as well as to limit erosion.

- Areas disturbed during construction work should be landscaped to a standard similar or better on completion of the works before replacement of the topsoil.

Erosion Remediation

- Do not allow erosion to develop on a large scale before affecting repairs. When in doubt, seek advice from the ECO.
- Repair all erosion damage as soon as possible.

Topsoil Management

- Traffic should be prevented on wet soil, a condition expected more during the rainy season.
 - The vegetation on the site must not be removed during construction.
 - Removal of vegetation must be restricted to excavation of trenches for installation of cables as well as the construction of a substation and inverters.
 - Construction must be limited to the demarcated site.
 - Excavated topsoil must be kept separate from the subsoil.
 - Solar panel frames must be anchored by means of anchor screws which do not necessitate the removal of topsoil and will lead to the least disturbance of the soil surface.
 - Earthworks must be limited to the construction of the substation, inverters, guardhouse and other buildings.
 - Topsoil removed for the excavation of trenches for the installation of cables will be kept separate and will be replaced in original sequence.
 - Any excess topsoil will be used to rehabilitate the area after construction has ceased.
 - It must be ensured that the slope of stockpiled material is such that surface runoff is minimal.
 - Additions of stabilising agents to stockpiles such as organic material or vegetative cover must be employed to prevent erosion of stockpiles.
- Soils must be stockpiled for the minimum period before re-use.

6.2.5 Control of Alien Plants

- Identify, locate and map all exotics and invasive plants to be eradicated.
- Control involves destroying the alien species present, destroying the seedlings which emerge, and establishing and managing an alternative plant cover to limit re-growth and re-invasion.

- Monitor all sites disturbed by construction activities for colonisation by exotics and invasive plants and eradicate these as they emerge.
- Follow manufacturers instructions at all times, especially in terms of quantities, time of application, etc. when using herbicides.
- Ensure that only registered weed control officers are appointed to make use of chemicals.
- Remove identified exotics and invasive plants using the most appropriate method of eradication.

6.2.6 Rehabilitation of the Construction Site

Removal of structures and infrastructure

- Clear and completely remove from site all constructional plant, equipment, storage containers, temporary fencing, temporary services, fixtures and other temporary works.
- Ensure that all access roads utilised during construction are returned to a usable state and/or a state no worse than prior to construction.

Inert waste and rubble

- Clear the site of all inert waste and rubble, including surplus rock, foundations and batching plant aggregates.
- Load and haul excess spoil and inert rubble to dump sites indicated/approved by the ECO.
- Remove from site all domestic waste and dispose of in the approved manner.

Rehabilitation of work areas and access roads

- All structures comprising the construction camp are to be removed from the site.
- Roads and areas devoid of vegetation or where soil has been compacted owing to traffic shall be ripped, to ensure re-growth of vegetation. This must only apply to construction areas that will not be utilised during the operational phase. Should ripping prove not to be sufficient to allow for re-vegetation the area must be rehabilitated by the use of hydro-seeding with grass species occurring around the site.
- Areas where disturbance of the soil surface has occurred should be covered with a final layer of topsoil that was removed and stored for rehabilitation.
- If reasonable assessment indicates that the re-establishment of vegetation is unacceptably slow, the soil should be analysed and any deleterious effects on the soil be corrected and the area be seeded with a seed mix that represents the natural surrounding vegetation.

- Allow for a maintenance period of one year following practical completion, unless otherwise specified.
- Re-vegetation must match the vegetation type which previously existed, unless otherwise indicated by the ECO.
- Stack branches or other vegetation refuse over the topsoil to protect emerging seedlings and retain soil moisture as well as to prevent soil erosion.
- Bare areas that show no specified vegetation growth after three months of the rehabilitation work are to be spread with additional topsoil, ripped to a depth of 100mm and re-planted, re-sodded, re-hand sown or re-hydroseeded.
- Control weeds as stipulated under **6.2.5 Control of Alien Plants**.
- Weed control should be practised for a period of at least 5 years following cessation of construction.

6.3 Maintenance and Operation Phase

- Appoint an Environmental Control Officer (ECO) during operation whose duty it will be to minimise impacts on surrounding sensitive habitats.

6.3.1 Protection of Vegetation and Animals

- Actively protect all plants and animals identified for protection. These include but are not limited to:
 - Demarcated and intact areas of the dwarf succulent (*Nananthusvittatus*).
 - Demarcated and intact areas of Trapdoor Spider (*Stasimopus spp.*) colonies.
 - Any endangered Sungazer Lizards (*Cordylusgiganteus*) that may have been re-located.
 - Any small mammal species that may inhabit the site after construction has ceased.
- Monitoring of the above populations by the ECO.
- Monitoring of bird fatalities must be carried out. Employees must be educated to perform basic acquisition of fatality data. Data accumulated must be submitted to the relevant organisation such as BirdLifeSA.
- All activities must be limited to the identified work areas and access roads.
- No hunting, capturing or harming of any faunal species on the site must be allowed.
- No open fires are permitted.

- The established buffer zone of 30 meters from the seasonal stream and other small wetlands must be maintained at all times.
- Provide adequate fire fighting equipment on site.
- Ensure that appropriate communication channels are established in the event of a fire.
- The perimeter road around the facility should be maintained as a fire break.
- An emergency evacuation plan should be drawn up.
- Control of alien vegetation should continue during operation. Control should involve the destroying of aliens present, destroying the seedlings which emerge, and establishing and managing an alternative plant cover to limit re-growth and re-invasion.
- Monitor all sites disturbed by construction and/or operational activities for colonisation by exotics or invasive plants.
- Follow manufacturer's instructions at all times when using herbicides, especially in terms of quantities, time of application, etc.
- Ensure that only registered weed control officers are appointed to make use of chemicals.
- Remove identified exotics and invasive plants using the most approved method of eradication.

6.3.2 Access Roads

- Make use of the existing access road and maintenance roads that were upgraded and used during the construction phase.
- Runoff from roads must be managed to avoid erosion and pollution problems.
- Maintain all access roads and roads adequately in order to minimise erosion and undue surface damage.
- Repair rutting and potholing
- Clean and make good any damage to public or private roads in use.
- Vehicles may not leave the designated roads or pull off these roads.
- No off-road driving is permitted.
- Adequate drainage and erosion protection in the form of side drains, cut-off berms or trenches must be provided where necessary.
- Regularly remove topsoil (and other material) accumulated in side drains of roadways to keep these open and functional.
- Maintain the public dirt roads in their current condition.

6.3.3 Maintenance of Solar Panels and Infrastructure

- For bare areas that have failed to establish, replace plants with the same species as originally specified.
- Areas that remain bare after a period of re-vegetation should be spread with additional topsoil, ripped to a depth of 100mm and re-planted, re-sodded, re-handsown or re-hydroseeded using the same species as originally specified.
- Any panels that need replacement should be removed and disposed of at a licensed landfill site.
- Water utilised for the cleaning of solar panels should be authorised in accordance with section 21 of the National Water Act 1998.
- The water utilised for the washing of the solar panels will only contain dust and may be allowed to percolate into the soil. This will also promote vegetation growth.

6.3.4 Site Management

Solid Waste

- Suitable covered receptacles shall be available at all times and conveniently placed for disposal of waste. All receptacles should be suitably covered.
- Waste must regularly be removed and disposed of at an authorised disposal facility (Allanridge/Odendaalsrus).
- No solid waste may be burned on site.
- No solid waste may be buried on site.
- Minimise waste by sorting recyclable and non-recyclable wastes.

Liquid Wastes

- The use of Ecosan waterless, composting toilets must be implemented in the guardhouse on the site. These toilets must be maintained in a hygienic manner and removal of waste should be done by contractor with the necessary accreditation and permits. The sewage disposal should also be handled by the contractor and proof of responsible disposal must be kept on the site. It must also be assured that a sufficient number of these toilets are installed to meet the needs of the operational workforce on the site.
- The waterless compost sewage produced by these Ecosan toilets must be disposed of by a contractor certified to do so.

- Polluted runoff water must be isolated and not be allowed to enter drainage lines, seasonal stream, wetlands or storm water canals.

Hazardous Waste

- Ensure compliance with all national, regional and local legislation with regard to the disposal of hydrocarbons, chemicals, solvents and any other harmful and hazardous substances and materials.
- Collect any hazardous waste in clearly marked receptacles located on a drip tray on site pending disposal. All receptacles should be suitably covered.
- All spills should be cleaned up immediately by removing the spillage together with the polluted soil and be disposed of as hazardous waste.
- Retain waste oils and batteries for recycling by the supplier wherever possible.
- Regularly dispose of all hazardous not earmarked for reuse, recycling or resale (such as oil contaminated with chlorinated hydrocarbons, electrical cleaning solvent, certain chemicals and fluorescent tubes) at a registered hazardous waste disposal site.
- Contain chemical spills, and arrange for cleanup by the supplier, or by professional pollution control personnel.

Pollution Control

- Immediately clean any accidental oil or fuel spills or leakages.
- Report major spills to the provincial Department of Water Affairs, as well as to the relevant Local Authority.
- Spill kits must be available on site and in all vehicles that transport hydrocarbons. Spill kits must be made up of material/product that is in line with environmental best practise (SUNSORB is a recommended product that is environmentally friendly).

Implements and Equipment

- All equipment on site must be inspected for diesel/oil leaks prior to operation.
- Leakages must be repaired as soon as possible and drip trays must be placed underneath machinery until such leakages have been repaired.

Air quality and Noise control

- The liberation of dust into the surrounding environment shall be effectively controlled by the use of, *inter alia*, water spraying and/or other dust-allaying agents.
- The speed of trucks and other vehicles must be strictly controlled and a speed limit of 40km/h should be maintained on the gravel road from the turnoff to the Grootspuit 252/0 farm to avoid dangerous conditions, excessive dust or excessive deterioration of the road being used.
- Unless otherwise specified normal work hours will apply (i.e. from 07h00 to 17h00, Mondays to Fridays).
- If noise levels at the boundaries of the site exceed 7dB above ambient levels, then the local health authorities are to be informed
- Fit silencers to all maintenance vehicles

Visual Impact

- The conditions as stipulated under the construction phase for the mitigation of the visual impact must be maintained and continued during the operational phase.

Fire Control

- Take adequate precautions to ensure that fires are not started as a result of works on site.
- The Applicant will be held liable for any damage to property adjoining the site as a result of any fire caused by one of his employees.
- No open fires are permitted anywhere on site.
- The perimeter road that has been constructed to act as a fire break must be maintained and kept free of dry vegetative matter. This road must not exceed a width of 5m and must be maintained regularly.
- Ensure that fire fighting equipment is kept on site at all times. This equipment must include fire beaters and fire extinguishers.
- Take immediate steps to extinguish any fire which may break out on the facility site.
- Do not store any fuel or chemicals under trees.
- Do not store gas and liquid in the same storage area.
- Do not permit smoking within 3m of any fuel or chemical storage area or refuelling area.

Hazardous substances

- Ensure compliance with all national, regional and local legislation with regard to the storage, transport and use of hydrocarbons, chemicals, solvents and any other harmful and hazardous substances and materials.
- Keep a record of all hazardous substances stored on the site for submission to the environmental manager.
- Hazardous substances such as diesel, oil etc. must be stored in dedicated areas developed to minimise spills. All storage areas, spillage containment areas, containers of hazardous substances and dangerous equipment must be clearly labelled as such.
- All hazardous substance storage tanks must be erected inside a concrete bund wall with sufficient capacity to contain 110% of the volume of the contents of a full tank. The bund wall system must be impenetrable and be in accordance with SANS 10089:1.
- All bunded areas must be underlain by a concrete slab or liner, sloped toward a sump for spillage removal.
- Treat spills within the bund and the contents of the sump as hazardous waste.
- All hazardous substances storage tanks must be so located as to pose the least risk to environmental pollution, i.e. the tanks must be placed above the 1:100 year floodline of the seasonal stream.
- Empty containers in which hazardous substances were kept are to be treated as hazardous waste.

6.3.5 Erosion management

- Protect all areas susceptible to erosion and ensure that there is no undue soil erosion resultant from the activities within and adjacent to the site.
- Do not permit vehicular or pedestrian access into natural areas beyond the demarcated boundary of the site.
- Do not allow erosion to develop on a large scale before effecting repairs. Repair all erosion damage as soon as possible.

6.4 Decommissioning- and Closure Phase

The solar panels proposed for this facility will have a lifespan of approximately 25 years. After the lifespan of 25 years the applicant would most likely replace the spent solar panels with new technology and continue to generate electricity. It is therefore improbable that the facility will be decommissioned. However, this is not definite and therefore this phase is also included in the Environmental Management Programme (EMPr). A detailed Rehabilitation Plan should be developed and submitted to the Free State Department of Economic Development, Tourism and Environmental Affairs as well as the National Department of Environmental Affairs should the project be decommissioned and the site be rehabilitated in future. **Please refer to the attached decommissioning plan attached to the EMPr. It must however be kept in mind that rehabilitation techniques and waste classification will change over time and this decommissioning plan must be amended and re-submitted to the above named departments.** At present, it is not anticipated that the project will undergo decommissioning and/or closure. However, should the facility at some time become abandoned or demolished, the following minimum management measures will be implemented:

- The infrastructure will be removed during the Decommissioning Phase. Any scrap metal will be sold to a scrap metal business and any metal and scrap unable to be utilised will be removed and disposed of at a registered landfill site in Allanridge/Odendaalsrus.
- Any concrete surfaces will be removed and compacted areas will be ripped and re-vegetated, depending on the end land use to be decided upon at the time.
- The minimum of vegetation present should be removed. Natural vegetation that is anticipated to have established during the operational phase must not be disturbed.
- Any removed panels will be collected in appropriate receptacles and disposed at the authorised landfill site in Allanridge/Odendaalsrus.
- No dumping of any solid waste generated during the removal and / or renewal of any panels will be allowed on site.

In addition to the above, the applicant should:

- Ensure that suitable arrangements are made to protect the environment against long term negative impacts.
- Clean up contaminants of the environment.
- Prevent erosion through regular monitoring and rehabilitation of degraded areas.

- Prevent spreading of exotic species from the site.
- Minimize negative visual impacts.

7. ENVIRONMENTAL MONITORING AND AUDITING

An independent Environmental Control Officer (ECO) must be employed by the applicant. The ECO will be responsible for managing the day-to-day on-site implementation of the EMPr, conditions in the Environmental Authorisation and other legal and best practise management options, and for the compilation of an audit report. The frequency of these audits will be stipulated in the Environmental Authorisation, if not the frequency will be determined by Solairedirect Southern Africa (pty) Ltd. In addition, the ECO must act as liaison and advisor on all environmental and related issues, seek advice when necessary and ensure that any complaints received from the public are duly processed and addressed and that conflicts are resolved in an acceptable manner.

A qualified ecological specialist must form an integral part in the monitoring of all faunal and floral populations as stipulated in the EMPr, Final EIR and Ecological Specialist Report to ensure that the integrity of these populations are left intact.

The duties of ECO will not only be to ensure conformance with the EMPr, but also to monitor any environmental issues and impacts which have not been accounted for in the EMPr that are, or could result in significant environmental impacts for which corrective action is required.

The Environmental Control Officer must:

- Have the appropriate experience and qualifications to undertake the necessary tasks.
- Be well conversed with the EMPr requirements and environmental studies.
- Understand the relevant environmental legislation and processes.
- Understand the hierarchy of Environmental Compliance Reporting and the implications of Non-Compliance.
- Ensure adequate and appropriate interventions to address non-compliance.
- Know the background of the project and understand the implementation programs.
- Be able to resolve conflicts and make recommendations on site in terms of the requirements.
- Provide a mechanism for the lodging and resolution of public complaints.
- Ensure appropriate and adequate record keeping related to environmental compliance.

The main objective of the proposed monitoring programme is to detect any changes that take place in the environment over time and involve the measuring and recording of physical variables associated with the operation of the solar facility. A qualified ecological specialist should form an integral part of the monitoring programme; this pertains especially to the protected and endangered

flora and fauna. The ecological specialist must always be consulted by the ECO with respect to decision making when it comes to populations of protected or endangered flora and fauna. Aspects that will require monitoring during the life cycle of the proposed project are:

- Compliance to best practise, the EMP, conditions in the Environmental Authorisation and any other permits and licenses obtained.
- Monitoring of any re-located populations of flora and fauna. These pertain especially to the likelihood of endangered Sungazer (*Cordylus giganteus*) occurring on the site.
- Monitoring of any populations of protected species remaining on the site. These pertain especially to the population of Trapdoor Spider (*Stasimopus sp.*) and dwarf succulents (*Nananthus sp.*).
- Monitoring of all faunal populations on the site. These pertain especially to the movement of mammals out of the site as well as the monitoring of animal burrows.
- Monitoring of any faunal fatalities during the construction and operational phase of the project.
- Monitoring of bird fatalities during the operational phase of the project.

All monitoring data will be documented and will be made available to any conservation body, Department of Environmental Affairs or any other entity with legitimate interest in the matter. If re-location of any protected or endangered fauna takes place the re-located population must be monitored daily during the first two weeks following re-location. Monitoring of such populations should take place weekly thereafter for a period of one year.

Table 1: A table indicating the Responsible Person, Performance Indicators as well as the Time Frame for Implementation of Mitigation Measures

Activity	Potential Impact	Mitigation	Responsible Person	Performance Indicators	Time Frame
Health and safety: Potential dangerous working conditions, e.g. construction vehicles, etc.	<ul style="list-style-type: none"> Potential safety risks to employees 	<ul style="list-style-type: none"> Equip all employees and / or contractors working on the site with the necessary protective gear. Implementation of safety induction. Training on the relevant machinery. 	<ul style="list-style-type: none"> Contractor 	<ul style="list-style-type: none"> No occurrence of injuries to employees / contractors on duty 	<ul style="list-style-type: none"> With appointment
Demarcation of the site	<ul style="list-style-type: none"> Degradation of surrounding environment 	<ul style="list-style-type: none"> Demarcate the extent of the construction site as indicated by the layout plan. Respect the 30 m buffer zone along the seasonal stream. Do not remove vegetation on the construction site by grading. Do not abstract water from any surface water source on the property. 	<ul style="list-style-type: none"> Contractor 	<ul style="list-style-type: none"> No degradation of the surrounding environment outside the construction footprint. 	<ul style="list-style-type: none"> Construction and Operational Phase
Provision of services to the workforce	<ul style="list-style-type: none"> Unsuitable working conditions 	<ul style="list-style-type: none"> Site establishment must take place in an orderly fashion and all required amenities must be installed prior to arrival of the main workforce. Potable water must be available at the site office and other convenient locations and must comply with the standards for potable water. Ample chemical toilets must be placed on site and must be maintained and cleaned regularly. 	<ul style="list-style-type: none"> Contractor 	<ul style="list-style-type: none"> Suitable working conditions for the workforce. 	<ul style="list-style-type: none"> Construction and Operational Phase
Protection of plant and animal life	<ul style="list-style-type: none"> Destruction of the natural environment 	<ul style="list-style-type: none"> All activities must be limited to the identified work areas and access roads. No hunting, capturing or harming of any faunal species on the site must be allowed. No open fires are permitted. The vegetation on the construction site must not be removed on the site. Removal of vegetation must be restricted to 	<ul style="list-style-type: none"> Applicant, Contractor & ECO 	<ul style="list-style-type: none"> Limited destruction of the natural environment 	<ul style="list-style-type: none"> Primarily Construction Phase but ongoing throughout the Operational Phase

Activity	Potential Impact	Mitigation	Responsible Person	Performance Indicators	Time Frame
		<p>excavation of trenches for installation of cables as well as the construction of a substation, inverters, guardhouse and other buildings.</p> <ul style="list-style-type: none"> • Construction must be limited to the demarcated construction area. • Solar panel frames must be anchored by means of anchor screws which have the least impact on the soil surface and vegetation. • A portion of the dwarf succulent (<i>Nananthusvittatus</i>) population should be kept intact. • A portion of the Trapdoor Spider (<i>Stasimopus spp.</i>) population should be kept intact. • Burrows must be identified and demarcated prior to construction and left intact during the initial 6 months of construction. • The colony of protected Suricate (<i>Suricatasuricatta</i>) (S 27.73647° E 26.77241°) must be demarcated prior to construction and no construction must be allowed within the area for 6 months during the initial construction. • The fence surrounding the facility must allow for small mammals to enter the area, • The facility must maintain a 30meter buffer from the annual stream and small wetlands on the property. • Bird flappers must be attached where overhead power lines are to be constructed. • The placement of the proposed new section of power line should be such that the impact on bird life is kept to a minimum. • Removal of nests should only take place during the winter months when limited breeding takes place. • The installation of artificial nests should be considered. 			

Activity	Potential Impact	Mitigation	Responsible Person	Performance Indicators	Time Frame
		<ul style="list-style-type: none"> If specimens of the endangered Sungazer Lizard (<i>Cordylus giganteus</i>) were identified and re-located during the design phase monitoring of these populations should continue as stipulated under 6.1 Design Phase. No illegal collecting of any possible Sungazer Lizards may be permitted. 			
Protection of cultural historical aspects	<ul style="list-style-type: none"> Destruction of important archeological or palaeontological deposits 	<ul style="list-style-type: none"> Should any objects of archaeological remains, graves or skeletal material be found during construction activities, work must immediately stop in that area and the ECO must be informed. The ECO must inform the South African Heritage Recourse Agency (SAHRA). No work may be resumed in this area without the permission from the ECO and SAHRA. The two grave sites on the property should be demarcated and no activities of any sort may occur around these gravesites. 	<ul style="list-style-type: none"> Contractor & ECO 	<ul style="list-style-type: none"> No destruction of important archeological or palaeontological deposits 	<ul style="list-style-type: none"> Construction Phase
Laydown area	<ul style="list-style-type: none"> Destruction of environment outside the temporary laydown area 	<ul style="list-style-type: none"> Clearly indicate which activities are to take place within which areas of the site. The laydown area must be fenced or suitably secured. All storage of construction materials should take place within this laydown area. The temporary construction laydown area must contain all relevant infrastructure. The temporary construction laydown area shall be located as indicated by the layout plan and shall not exceed 4 800 m² as indicated by the layout plan. 	<ul style="list-style-type: none"> Contractor 	<ul style="list-style-type: none"> No destruction of environment outside the temporary laydown area 	<ul style="list-style-type: none"> Construction Phase
Access roads	<ul style="list-style-type: none"> Degradation and destruction of environment outside the boundaries of access roads 	<ul style="list-style-type: none"> Access roads to the site must be clearly demarcated. The existing dirt roads on the property should be utilised for access to the site as indicated on the layout plan. Enforce speed limits at all times, both on public roads 	<ul style="list-style-type: none"> Contractor & ECO 	<ul style="list-style-type: none"> No destruction or deterioration of environment along access roads 	<ul style="list-style-type: none"> Primarily Construction Phase but ongoing maintenance throughout

Activity	Potential Impact	Mitigation	Responsible Person	Performance Indicators	Time Frame
		and on site roads. <ul style="list-style-type: none"> • Vehicles may not leave the designated roads or pull off these roads. • Runoff from roads must be managed to avoid erosion and pollution problems. • Maintain all access roads adequately in order to minimise erosion and undue surface damage. • Clean and make good any damage to public roads in use. • Regularly remove topsoil (and other material) accumulated in side drains of roadways to keep these open and functional. 			Operational Phase
Solid Waste	<ul style="list-style-type: none"> • Pollution of the environment 	<ul style="list-style-type: none"> • Suitable covered receptacles shall be available at all times • Waste must regularly be removed and disposed of at an authorised disposal facility (Allanridge/Odendaalsrus). • No solid waste may be burned on site. • No solid waste may be buried on site. • Any construction solid waste generated during the Construction Phase will be removed from site and disposed of at an authorised landfill site (Allanridge/Odendaalsrus). • Minimise waste by sorting recyclable and non-recyclable wastes. • Any recyclable waste (e.g. scrap metal) generated during construction will be sold to a third party for recycling. 	<ul style="list-style-type: none"> • Contractor 	<ul style="list-style-type: none"> • No pollution of the immediate and surrounding environment 	<ul style="list-style-type: none"> • Primarily during Construction Phase but also ongoing during Operational Phase.
Liquid Wastes	<ul style="list-style-type: none"> • Pollution of the environment 	<ul style="list-style-type: none"> • Do not locate any site toilet, sanitary convenience, septic tank or French drain within the 1:100 year floodline, or within a horizontal distance of 100m of the river. • The sewage waste from these chemical toilets must be disposed of at a Waste Water Treatment Works (WWTW) in the nearest town. 	<ul style="list-style-type: none"> • Contractor 	<ul style="list-style-type: none"> • No pollution of water resources and the environment 	<ul style="list-style-type: none"> • Construction Phase

Activity	Potential Impact	Mitigation	Responsible Person	Performance Indicators	Time Frame
		<ul style="list-style-type: none"> • Polluted runoff water must be isolated and not be allowed to enter drainage lines, seasonal stream, wetlands or storm water canals. • Provide containment and settlement ponds for effluent from concrete mixing and washing (concrete vehicle wash bag) facilities. 			
Hazardous Waste	<ul style="list-style-type: none"> • Pollution of the environment 	<ul style="list-style-type: none"> • Collect any hazardous waste in clearly marked receptacles located on a drip tray on site pending disposal. All receptacles should be suitably covered. • All spills should be cleaned up immediately by removing the spillage together with the polluted soil and be disposed of as hazardous waste. • Retain waste oils and batteries for recycling by the supplier wherever possible. • Regularly dispose of all hazardous not earmarked for reuse, recycling or resale at a registered hazardous waste disposal site. 	<ul style="list-style-type: none"> • Contractor 	<ul style="list-style-type: none"> • No pollution of the environment 	<ul style="list-style-type: none"> • Primarily during Construction Phase but ongoing throughout the Operational Phase
Pollution Control	<ul style="list-style-type: none"> • Pollution of the environment 	<ul style="list-style-type: none"> • Ensure that no storm water is allowed to enter storage areas • Ensure that water passing through wash bays and workshops pass through oil baffles/oil traps/oil separators before passing into conservancy tanks. • Treat all oil sludge collected in the traps, including sump liners, as hazardous waste. • Immediately clean any accidental oil or fuel spills or leakages. • Use plastic trays or liners when mixing cement and concrete. • Dispose of all visible remains of excess cement and concrete after the completion of tasks. • Spill kits must be available on site and in all vehicles that transport hydrocarbons. 	<ul style="list-style-type: none"> • Contractor 	<ul style="list-style-type: none"> • Adequate handling of any spills or pollutants and no pollution of the environment 	<ul style="list-style-type: none"> • Construction Phase
Implements and equipment	<ul style="list-style-type: none"> • Pollution of the environment 	<ul style="list-style-type: none"> • All equipment on site must be inspected for diesel/oil leaks prior to operation. 	<ul style="list-style-type: none"> • Contractor 	<ul style="list-style-type: none"> • Adequate maintenance of 	<ul style="list-style-type: none"> • Primarily Construction Phase

Activity	Potential Impact	Mitigation	Responsible Person	Performance Indicators	Time Frame
		<ul style="list-style-type: none"> Leakages must be repaired as soon as possible and drip trays must be placed underneath machinery until such leakages have been repaired. 		equipment and prevention of pollution of the environment	but also ongoing throughout the Operational Phase
Air quality and Noise control	<ul style="list-style-type: none"> Air and noise pollution 	<ul style="list-style-type: none"> The liberation of dust into the surrounding environment shall be effectively controlled by the use of, <i>inter alia</i>, water spraying and/or other dust-allaying agents. The speed of trucks and other vehicles must be strictly controlled. Unless otherwise specified normal work hours will apply. Notify adjacent landowners of after-hours construction work and of any other activity that could cause a nuisance. Fit silencers to all construction vehicles. 	<ul style="list-style-type: none"> Contractor 	<ul style="list-style-type: none"> No disturbance of surrounding neighbours and no air pollution 	<ul style="list-style-type: none"> Construction Phase
Visual Impact	<ul style="list-style-type: none"> Degradation of the aesthetics and sense of place of the surroundings. 	<ul style="list-style-type: none"> The vegetation on the site should be allowed to re-establish after construction. Cables should be placed underground as far as possible. Signs associated with the facility should be restricted to the entrance gates. External lighting should be carefully chosen to minimise the visual impact associated with artificial lighting. Use materials, coatings and paint that do not reflect. 	<ul style="list-style-type: none"> Applicant & Contractor 	<ul style="list-style-type: none"> Minimal impacts on the aesthetics and sense of place 	<ul style="list-style-type: none"> Construction Phase
Fire Control	<ul style="list-style-type: none"> Damage caused by frequent veld fires 	<ul style="list-style-type: none"> Take adequate precautions to ensure that fires are not started as a result of works on site. No open fires are permitted anywhere on site. Construct a perimeter road around the facility that will act as a fire break. Ensure that fire fighting equipment is kept on site at all times. Do not store any fuel or chemicals under trees. 	<ul style="list-style-type: none"> Contractor 	<ul style="list-style-type: none"> No veld fires caused by activities on the solar facility 	<ul style="list-style-type: none"> Construction and Operation Phase

Activity	Potential Impact	Mitigation	Responsible Person	Performance Indicators	Time Frame
		<ul style="list-style-type: none"> Do not store gas and liquid in the same storage area. 			
Hazardous Substances	<ul style="list-style-type: none"> Pollution of the environment 	<ul style="list-style-type: none"> Keep a record of all hazardous substances stored on the site for submission to the ECO. Hazardous substances must be stored in dedicated areas developed to minimise spills. All hazardous substance storage tanks must be erected inside a concrete bund wall with sufficient capacity to contain 110% of the volume of the contents of a full tank. All bunded areas must be underlain by a concrete slab or liner, sloped toward a sump for spillage removal. Treat spills within the bund and the contents of the sump as hazardous waste. Empty containers in which hazardous substances were kept are to be treated as hazardous waste. 	<ul style="list-style-type: none"> Contractor 	<ul style="list-style-type: none"> No pollution of the environment due to hazardous substance spills 	<ul style="list-style-type: none"> Primarily Construction Phase but ongoing throughout the Operational Phase
Erosion protection	<ul style="list-style-type: none"> Erosion of the soil surface 	<ul style="list-style-type: none"> Sgsdhd Protect all areas susceptible to erosion on site. Do not permit vehicular or pedestrian access into natural areas beyond the demarcated boundary of the construction area. Use geotextiles where appropriate for the prevention of erosion. Levelling of the site will not be done; the topography of the site will be kept intact. Areas prone to damming and problematic storm water flow areas should be addressed by the implementation of appropriate storm water control measures. Areas disturbed during construction work should be landscaped to a standard similar or better on completion of the works before replacement of the topsoil. 	<ul style="list-style-type: none"> Contractor & ECO 	<ul style="list-style-type: none"> No erosion of the soil surface on or around the construction site 	<ul style="list-style-type: none"> Primarily during the Construction Phase but ongoing monitoring and maintenance during the Operational Phase

Activity	Potential Impact	Mitigation	Responsible Person	Performance Indicators	Time Frame
Topsoil Management	<ul style="list-style-type: none"> Degradation of the topsoil stockpiles and <i>in situ</i> topsoil 	<ul style="list-style-type: none"> The vegetation on the site must not be removed during construction. Removal of vegetation must be restricted to excavation of trenches for installation of cables as well as the construction of a substation and inverters. Excavated topsoil must be kept separate from the subsoil. Solar panel frames must be anchored by means of anchor screws which do not necessitate the removal of topsoil and will lead to the least disturbance of the soil surface. Earthworks must be limited to the construction of the substation, inverters, guardhouse and other buildings. It must be ensured that the slope of stockpiled material is such that surface runoff is minimal. Additions of stabilising agents to stockpiles such as organic material or vegetative cover must be employed to prevent erosion of stockpiles. Soils must be stockpiled for the minimum period before re-use. 	<ul style="list-style-type: none"> Contractor 	<ul style="list-style-type: none"> Limited disturbance and degradation of the soil surface 	<ul style="list-style-type: none"> Construction Phase
Control of alien plants	<ul style="list-style-type: none"> Infestation of the construction site with alien invaders 	<ul style="list-style-type: none"> Identify, locate and map all exotics and invasive plants to be eradicated. Control involves destroying the alien species present, destroying the seedlings which emerge, and establishing and managing an alternative plant cover to limit re-growth and re-invasion. Monitor all sites disturbed by construction activities for colonisation by exotics and invasive plants and eradicate these as they emerge. Remove identified exotics and invasive plants using the most appropriate method of eradication. 	<ul style="list-style-type: none"> Contractor & ECO 	<ul style="list-style-type: none"> Re-growth of indigenous species only. 	<ul style="list-style-type: none"> During Construction Phase but mainly during the rehabilitation of the Construction Phase and ongoing during the Operational Phase
Rehabilitation of the Construction Site	<ul style="list-style-type: none"> Retarded establishment of vegetation, high visual impact 	<ul style="list-style-type: none"> Clear and completely remove from site all constructional plant, equipment, storage containers, temporary fencing, temporary services, fixtures and 	<ul style="list-style-type: none"> Contractor & ECO 	<ul style="list-style-type: none"> Sppeedy recovery of vegetation, neat facility with 	<ul style="list-style-type: none"> At completion of Construction Phase but ongoing through

Activity	Potential Impact	Mitigation	Responsible Person	Performance Indicators	Time Frame
		<p>other temporary works.</p> <ul style="list-style-type: none"> • Clear the site of all inert waste and rubble. • All structures comprising the construction camp are to be removed from the site. • Roads and areas devoid of vegetation or where soil has been compacted owing to traffic shall be ripped, to ensure re-growth of vegetation. • Allow for a maintenance period of one year following practical completion, unless otherwise specified. • Re-vegetation must match the vegetation type which previously existed. • Bare areas that show no specified vegetation growth after three months of the rehabilitation work are to be spread with additional topsoil, ripped to a depth of 100mm and re-planted, re-sodded, re-hand sown or re-hydroseeded. • Weed control should be practised for a period of at least 5 years following cessation of construction. 		<p>no construction remnants visible</p>	<p>initial phase of Operation.</p>
<p>Monitoring of fauna and flora</p>	<ul style="list-style-type: none"> • Destruction or decline of remaining fauna and flora 	<ul style="list-style-type: none"> ▪ Actively protect all plants and animals identified for protection. These include but are not limited to: <ul style="list-style-type: none"> ▪ Demarcated and intact areas of the dwarf succulent (<i>Nananthusvittatus</i>). ▪ Demarcated and intact areas of Trapdoor Spider (<i>Stasimopus spp.</i>) colonies. ▪ Any endangered Sungazer Lizards (<i>Cordylusgiganteus</i>) that may have been re-located. ▪ Any small mammal species that may inhabit the site after construction has ceased. • Monitoring of the above populations by the ECO. • Monitoring of bird fatalities must be carried out. • Monitor all sites disturbed by construction and/or operational activities for colonisation by exotics or invasive plants. 	<ul style="list-style-type: none"> • Contractor & ECO 	<ul style="list-style-type: none"> • Healthy fauna & flora populations throughout operation 	<ul style="list-style-type: none"> • Initiated during the Construction Phase but primarily during the Operational Phase

Activity	Potential Impact	Mitigation	Responsible Person	Performance Indicators	Time Frame
Decommissioning and Closure	<ul style="list-style-type: none"> High visual impact due to dilapidated facility, degraded environment due to inadequate rehabilitation 	<ul style="list-style-type: none"> Strict adherence to attached Decommissioning Plan. Amending existing Decommissioning Plan to fit procedures and processes at the time of decommissioning. 	<ul style="list-style-type: none"> Contractor & ECO 	<ul style="list-style-type: none"> An environment devoid of human structures and fitting close to existing surrounding environment 	<ul style="list-style-type: none"> Decommissioning- & Closure Phase
EMPr compliance monitoring	<ul style="list-style-type: none"> N/A 	<ul style="list-style-type: none"> Environmental compliance assessment to verify compliance with the EMPr, EIR and conditions in the Environmental Authorisation during the Construction- and Operational Phases. 	<ul style="list-style-type: none"> Independent ECO 	<ul style="list-style-type: none"> Full compliance with the EMPr and RoD Reporting on compliance Minimum environmental impacts 	<ul style="list-style-type: none"> Construction Phase and Operational Phase