JUWI RENEWABLES ENERGY (PTY) LTD

Proposed Development of the Roos Solar Photovoltaic Energy Facility and Associated Infrastructure near Belfast in the Mpumalanga Province

Draft Environmental Management Programme

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Author:	**Phumela Madubela** BSc (Hons) Environmental Monitoring and Modelling (UNISA) Cand.Sci. Nat Registration No. 137670
Checked by:	**Natalie Pullen** MSc Environmental Biotechnology (Rhodes University) Reg. EAP (EAPASA) (#2018/132)
Approved by:	**Natalie Pullen** MSc Environmental Biotechnology (Rhodes University) Reg. EAP (EAPASA) (#2018/132)
Signature:	
Client:	JUWI Renewable Energies (Pty) Ltd

Confidentiality Statement

JUWI RENEWABLE ENERGIES (PTY) LTD

ROOS SOLAR PV FACILITY

DRAFT ENVIRONMENTAL MANAGEMENT PROGRAMME

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ROOS SOLAR ENERGY FACILITY

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1. INTRODUCTION

JUWI South Africa (Pty) Ltd (hereafter referred to as 'JUWI) is proposing to construct the Roos Solar PV Facility and associated Electrical Grid Infrastructure approximately 14km north east of Belfast, within the Emakhazeni Local Municipality, in the Nkangala District Municipality of the Mpumalanga Province. (**Figure 1**) (DFFE **Reference Number: TBA**). The overall objective of the proposed development is to generate electricity by means of renewable energy technologies capturing solar energy to feed into the national grid. The proposed development will have a maximum total generation capacity of up to 50 megawatts (MWac).

SiVEST Environmental Division has subsequently been appointed as the independent Environmental Assessment Practitioner (EAP) to undertake the required Draft Environmental Management Programme (EMPr) (in line with the National Environmental Management Act, 1998 (Act 107 of 1998)) for the proposed construction of the Roos Solar PV Facility and associated grid infrastructure. The proposed development requires an EA from the National Department Forestry, Fisheries and the Environment (DFFE). However, the provincial authority (i.e., the Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs (DARDLEA) will also be consulted.

This EMPr provides a set of guidelines for the environmental management of all works executed by the Developer, Engineer, Contractor and Sub-contractor/s to have a minimum impact on the environment in accordance with all relevant legislation, policies and standards. In this context, it should be viewed as a dynamic or "living" document which may require updating or revision during the life cycle of the development to address new circumstances as the need arises. It is essentially, a written plan of how the environment is to be managed in practical and achievable terms. The EMPr shall be deemed to have contractual standing on the developer and contractors onsite.

The effectiveness of the EMPr is limited by the level of adherence to the conditions set forth in this report by the Developer and the Contractor and Sub-contractors. It is further assumed that compliance with the EMPr will be monitored and audited on a regular basis as set out in the EMPr and contractual clauses.

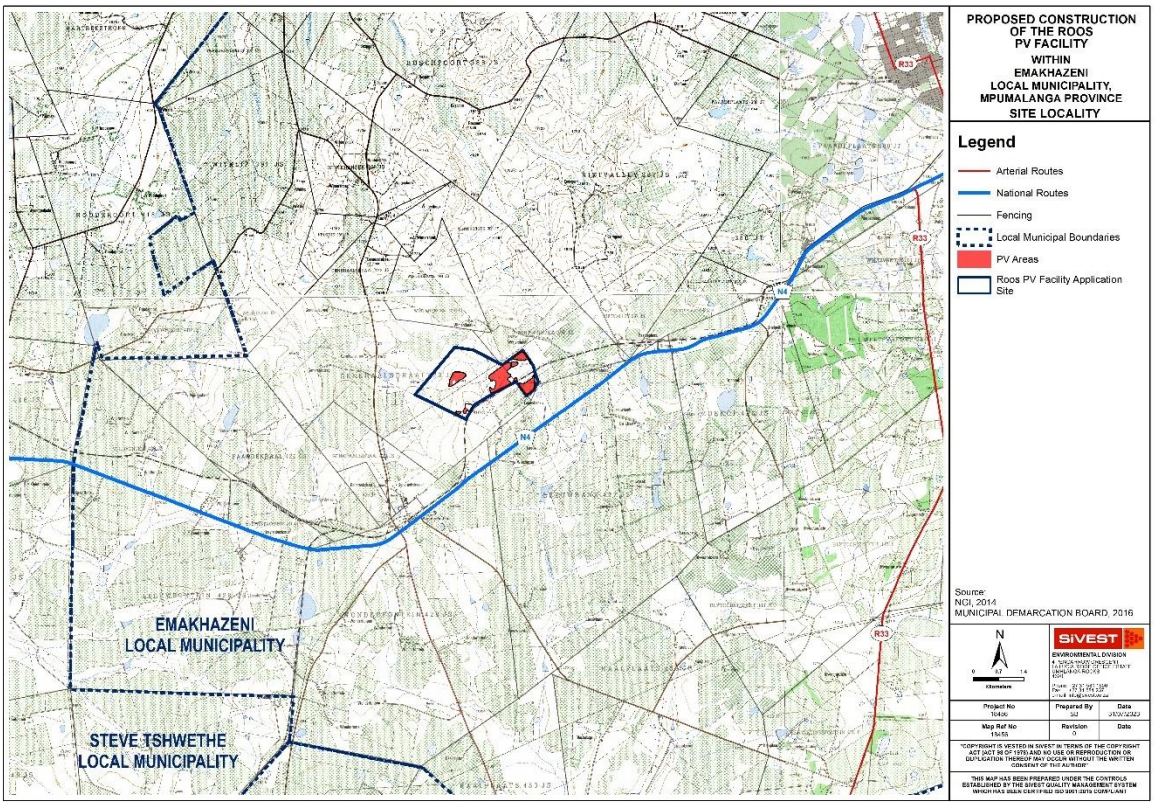

Figure 1: Site Locality

1.1 Content Requirements for an Environmental Management Programme (EMPr)

The content requirements for an EMPr (as provided in Appendix 4 of the EIA Regulations 2014, as amended), as well as details of which section of the report fulfils these requirements, are shown in **Table 1** below.

Table 1: Content requirements for a EMPr

2014 EIA Regulations, as amended.	Requirements for an EMPr	Location in this EMPr
Appendix 4, Section 1. (1)	An EMPr must comply with section 24N of the Act and include -	Refer to relevant sections below:
Appendix 4, Section 1 (a)	Details of –	-
	(i) The EAP who prepared the EMPr; and	Section 3.1 Section 3.2
	(ii) The expertise of that EAP to prepare an EMPr, including a curriculum vitae.	Section 3.2
Appendix 1, Section 3 (b)	a detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description;	Section 4.1
Appendix 4, Section 1 (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 should be avoided, including buffers;	Figure 1 and Figure 5

2014 EIA Regulations, as amended.	Requirements for an EMPr	Location in this EMPr
Appendix 4, Section 1 (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;	Section 9
Appendix 4, Section 3 (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 provision for rehabilitation, where applicable;	Section 9
Appendix 4, Section 3 (g)	the method of monitoring the implementation of the impact management actions contemplated in paragraph (f);	Section 9
Appendix 4, Section 3 (h)	the frequency of monitoring the implementation of the impact management actions contemplated in paragraph (f);	Section 9
Appendix 4, Section 3 (i)	an indication of the persons who will be responsible for the implementation of the impact management actions;	Section 8 Section 9
Appendix 4, Section 3 (j)	the time periods within which the impact management actions contemplated in paragraph (f) must be implemented;	Section 9
Appendix 4, Section 3 (k)	the mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f);	Section 9
Appendix 4, Section 3 (l)	a program for reporting on compliance, taking into account the requirements as prescribed by the Regulations;	Section 9
Appendix 4, Section 3 (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	Section 11
Appendix 4, Section 3 (n)	any specific information that may be required by the competent authority.	Section 7.3 Section 10
Appendix 4 Section 2	Where a government notice gazetted by the Minister provides for a generic EMPr, such generic EMPr as indicated in such notice will apply.	Generic EMPr has been compiled and included.

2. DETAILS OF APPLICANT

2.1 Name and contact details of the Applicant

Name and contact details of Applicant:

Table 2: Name and contact details of the applicant

Business Name of Applicant	JUWI Renewable Energies (Pty) Ltd
Physical Address	20th Floor, The Halyard, 4 Christiaan Barnard Street, Cape Town
Postal Address	20th Floor, The Halyard, 4 Christiaan Barnard Street, Cape Town
Postal Code	8001
Telephone	N/A
Fax	-
Email	pdza@juwi.co.za (Att Justine Wyngaardt)

3. DETAILS AND EXPERTISE OF THE EAP

3.1 Name and contact details of the Environmental Assessment Practitioner (EAP)

The table below provides the name and contact details of the Lead EAP for the project:

Table 3: Name and contact details of the Environmental Consultant who prepared the report

Business Name of EAP	SiVEST SA (PTY) Ltd
Name of Lead EAP	Natalie Pullen
Physical Address	12 Autumn Street, Rivonia, Sandton
Postal Address	PO Box 2921, Rivonia
Postal Code	2128
Telephone	+27 11 798 0633
Fax	-
Email	nataliep@sivest.com

3.2 Names and expertise of the EAPs

The table below provides the names of the people who prepared this report and their expertise:

Table 4: Names and details of the expertise of the EAP's involved in the preparation of this report

Name of representative of the EAP	Educational Qualifications	Professional Affiliations	Experience (years)
Natalie Pullen	MSc (Environmental Biotechnology)	EAPASA Registration No. 2018/132 IAIAsa	19

Name of representative of the EAP	Educational Qualifications	Professional Affiliations	Experience (years)
Phumela Madubela	BSc Hons Environmental Monitoring & Modelling	Cand.Sci.Nat Registration No. 137670 IAIAsa	7

CV's of SiVEST personnel and EAP declaration are attached in **Appendix A.**

3.3 Names and expertise of the specialists

Specialist studies have been conducted in terms of the Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(A) and (H) And 44 of the NEMA when applying for EA, as well as the EIA Regulations, 2014 (as amended). The table below provides the names of the specialists involved in the project:

Table 5: Names of specialists involved in the project

Company	Name of representative of the specialist	Specialist	Educational Qualifications	Experience (years)
Visual Resource Management Africa cc	Stephen Stead	Visual Impact Assessment	BA (Hons) Human Geography and Geographic Information Management Systems	28
CTS Heritage	Jenna Lavin	Heritage Impact Assessment	MSc. Archaeology (UCT), CPD in Conservation of the Built Environment (UCT)	12
	Elize Butler	Paleontological Impact Assessment	MSc Zoology	28
Limosella Consulting	Rudi Bezuidenhoudt	Aquatic Biodiversity Assessment	Professional registered SACNASP, Pr. Nat. Sci (008867), BSc. (Hons) Botany	12
ECO-Assist	Wayne Jackson	Agriculture and Soils Impact Assessment	B.Sc. Soil Science and Hydrology	14
Enviro Insight	Corné Niemandt	Terrestrial Biodiversity Assessment	MSc Plant Science Pr. Sci. Nat.	8
	Sam Laurence	Avifaunal Impact Assessment	BSc, BSC Hons, M.Sc. candidate. Pr. Sci. Nat. Zoological Science	15

Company	Name of representative of the specialist	Specialist	Educational Qualifications	Experience (years)
Social Risk Research	Eugene de Beer	Social Economic Impact Assessment	Master of Business Leadership BSc Town and Regional Planning	35
SiVEST SA	Ntuthuko Hlanguza	Transportation Study	Pr. Eng	7
iSHECON	Debra Mitchell	Quantitative Risk Assessment	MSc (Chem Eng) and Pr. Eng	25

4. ACTIVITY INFORMATION

4.1 Project Description

It is anticipated that the proposed Solar PV energy facility will include PV fields (arrays) comprising of multiple PV panels. In summary, the proposed SEF development will include the following components:

- The proposed solar PV plant will include PV fields (arrays) comprising multiple PV modules. The modules will be either crystalline silicon or thin film technology. The modules will be mounted on a fixed/single or double axis tracking technology.
- The panels will either be fixed to a single-axis horizontal tracking structure where the orientation of the panel varies according to the time of the day, as the sun moves from east to west; or tilted at a fixed angle equivalent to the latitude at which the site is located in order to capture the most sun (PV Panels Dimensions: approximately width:1000 mm and height:2000 mm.
- Internal 33kV lines connecting the substations to the facilities (either underground/above ground)
- Battery Energy Storage System (BESS) will be located next to each onsite 33/132kV substations and included in the IPP substation area. The BESS will be brought to the site already constructed.
- Site access road of up to 8m and internal access roads up to 6m wide, will provide access to the PV arrays. Existing site roads will be used wherever possible, although new site roads will be constructed where necessary.
- Site office and site construction camp with sanitation and canteen facilities, waste separation and storage areas on site.
- Permanent and temporary laydown areas will be constructed.

4.2 Alternatives

Activity alternative

No activity alternatives are being considered. Renewable Energy development in South Africa is highly desirable from a social, environmental and development point of view. Solar energy installations are more suitable for the site because of the good solar resource. The choice of technology selected for the Roos SEF was based on environmental constraints as well as technical and economic considerations.

The proposed layout has been assessed by the specialists in their respective specialist studies. All constraints identified to date have been taken into account and the layout has been refined to avoid all no-go areas.

Substation, BESS, Laydown and O&M' alternative

Two (2) substation, BESS, Laydown and O&M site alternatives have been considered and comparatively assessed by EAP and specialists.

Powerline route

Two electrical grid infrastructure are being considered and have been comparatively assessed by the EAP and specialists. Grid Integration for both the preferred and alternative substations will be connected in the same manner. The substation will connect to the existing 132kV overhead powerline via a double circuit 132kV loop-in, loop-out (LILO) overhead powerline configuration. The LILO is expected to be approximately 150m long within a corridor of approximately 100m. Pylon structures may be either steel lattice, steel monopole or woodpole structures. The powerline structure will be determined at final design stage after technical consultation with Eskom Engineers and after the geotechnical and topographical surveys have been conducted.

The Proposed Layout is reflected below in **Figure 2**.

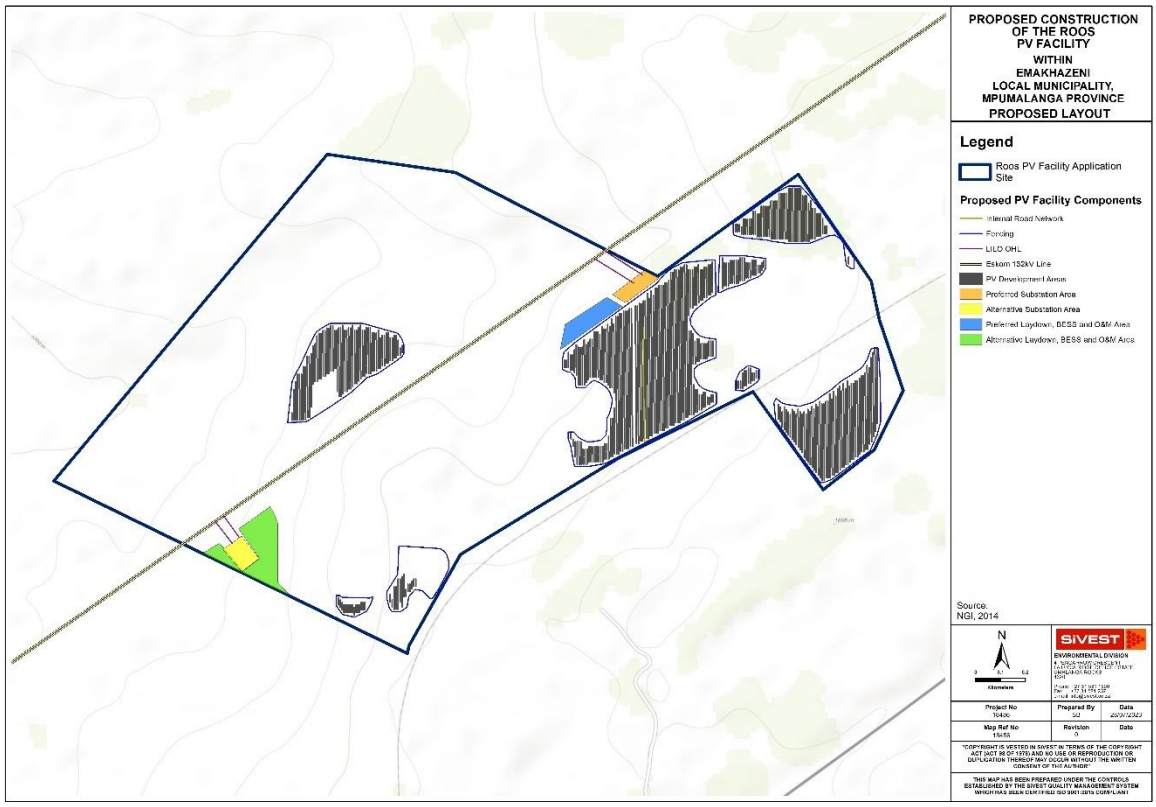

Figure 2: Proposed layout showing proposed location of Solar PV panel

Please refer to **Figure 3** below for the typical components of a Solar PV Panel

A summary of the project technical details is provided in **Table 6** below.

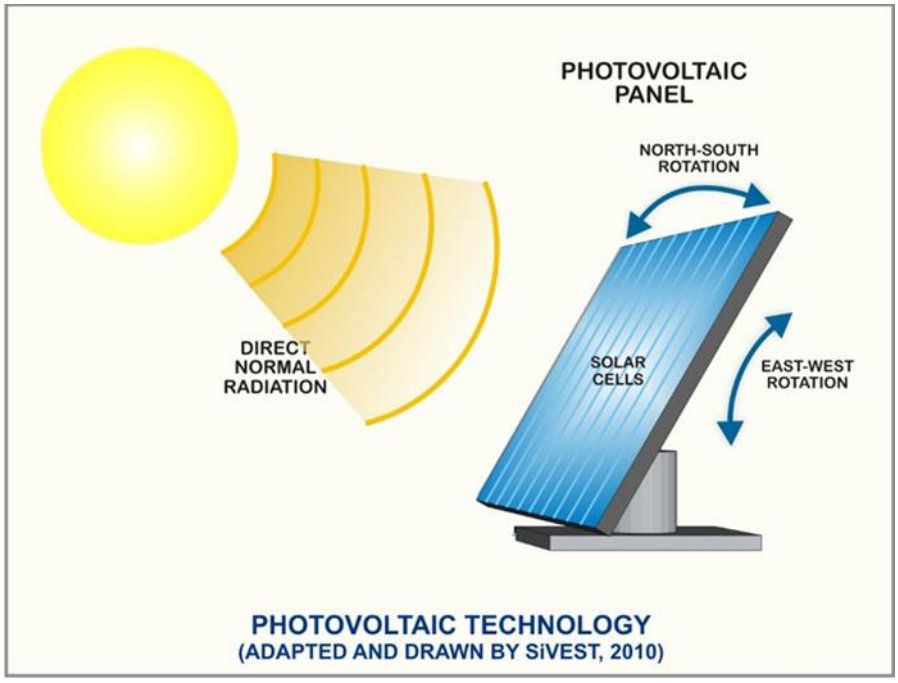

Figure 3: Typical components of a solar PV Panel

Table 6: Technical Detail Summary

TECHNICAL DETAILS	
PV panels	▪ Mounting: Fixed-tilt PV, single-axis tracking PV or double-axis tracking PV. ▪ Module type: mono- or bi-facial ▪ up to approx. 4.0m PV panels
Access roads	▪ Main site access: Up to 8m, during construction and operation ▪ Internal roads: Approx. 4 - 5m, during construction and operation ▪ Existing roads will be utilised as far as reasonably possible and upgraded where necessary. Upgraded width: Up to 8m.
On-site Substation	▪ Substation will generally be stepping up from 22kV or 33kV to 88kV or 132kV. ▪ Maximum height of on-site substations: up to 10 m ▪ The proposed project will include one on-site substation hub incorporating the facility substation, switchyard, collector infrastructure, battery energy storage system (BESS) and associated O&M buildings. ▪ Onsite substation size: Up to 4ha (for on-site substation hub)

TECHNICAL DETAILS	
Grid Integration	▪ The substation will connect to the existing 132kV overhead powerline via a double circuit 132kV loop-in, loop-out (LILO) overhead powerline configuration. ▪ The LILO is expected to be approximately 150m long within a corridor of approximately 100m ▪ The powerline structure will be determined at final design stage after technical consultation with Eskom Engineers and after the geotechnical and topographical surveys have been conducted. ▪ Pylon structures may be either steel lattice, steel monopole or woodpole structures.
Construction camp	▪ No construction camps would be developed, and labour would be sourced from nearby areas, as per relevant procurement requirements.
Temporary construction laydown / staging area	▪ Temporary Laydown Area: up to approximately 7 ha.
Operation and Maintenance (O&M) buildings	▪ All Auxiliary buildings to be developed include, but are not limited to: O&M building, site office, staff lockers, bathrooms, warehouses, etc. ▪ Footprint up to 0.5 ha (i.e., 5000 m^2) ▪ Height (m): Up to 10 m
On-site IPP Electrical infrastructure	▪ *"Cables will be laid underground wherever technically feasible, with overhead 33kV lines grouping PV areas to crossing valleys and ridges to get to the on-site substation."* ▪ The proposed project will include one on-site substation hub incorporating the facility substation, switchyard, collector infrastructure, battery energy storage system (BESS) and associated O&M buildings. ▪ Internal underground lines of up to 33 kV (22kV or 33kV). ▪ Substation will generally be stepping up from 22kV or 33kV to 88kV or 132kV. ▪ Depth (m): Up to 1.5 m
Fencing	▪ Height: Up to 3m ▪ The entire perimeter of the proposed facility will be secured. ▪ Length: TBC ▪ Type: Could be Palisade or mesh or fully electrified.
Boreholes and storage tanks (if applicable)	▪ If required, a 10,000l storage tank may be located on site for water storage.
Battery Energy Storage Systems	▪ Capacity in MWh: Up to 340MW/ 340MWh ▪ Size in hectare - A BESS would be developed within the substation/electrical infrastructure hub footprint, if required. ▪ Height: Up to 8 m ▪ Technology type (i.e.: Li-Ion solid state/Redox flow) Electrochemical Batteries including:

TECHNICAL DETAILS	
	a. Lead Acid and Advanced Lead Acid b. Lithium ion, NiCd, NiMH-based Batteries c. High Temperature (NaS, Na-NiCl2, Mg/PB-Sb) d. Flow Batteries (VRFB, Zn-Fe, Zn-Br) The BESS would therefore comprise the selected batteries together with chargers, inverters and related equipment.
Estimated number of employment opportunities generated by each PV project	▪ Construction phase: 100 (skills split would be in line with applicable procurement requirements but would be roughly 60% low-skilled, 25% semi-skilled and 15% skilled) ▪ Operational phase: 10 (skills split would be in line with applicable procurement requirements but would be roughly 70% low skilled, 25% semi-skilled and 5% skilled ▪ Decommissioning phase: unknown
Construction: Methodology	▪ The facility would be constructed in the following sequence: 1. Final design and micro-siting of the infrastructure based on topographical conditions and environmental sensitivities and following obtaining required environmental permits. 2. Vegetation clearance and construction of access roads (where required) 3. Construction of foundations 4. Assembly and erection of infrastructure on site 5. Stringing of inverters 6. Rehabilitation of disturbed areas 7. Continued maintenance
Construction: Duration and start date	Up to 12-18 months, the start date is dependent upon award of a bid. Construction activities could take place concurrently.

4.3 NEMA Listed Activities

The amended EIA Regulations promulgated under Section 24(5) of the National Environmental Management Act, Act 107 of 1998 and published in Government Notice No. R. 326 list activities which may not commence without environmental authorization from the Competent Authority. The proposed activity is identified in terms of Government Notice No. R. 327, 325 and 324 for activities which must follow a full Environmental Impact Assessment Process. The project will trigger the following listed activities:

Table 7: Listed activities in terms of NEMA: EIA Regulations 2014 (as amended in 2017), applicable to the proposed project.

Activity No(s):	Relevant activities as set out in Listing Notices 1, 2 and 3 of the EIA Regulations, 2014 as amended	Describe the portion of the proposed project to which the applicable listed activity relates.
Relevant Basic Assessment Activities as set out in Listing Notice 1		
11 (i)	**GN R. 327 (as amended) Item 11:** The development of facilities or infrastructure for	New on-site substations/ collector switching stations will be constructed as part of the proposed development. The

Activity No(s):	Relevant activities as set out in Listing Notices 1, 2 and 3 of the EIA Regulations, 2014 as amended	Describe the portion of the proposed project to which the applicable listed activity relates.
	the transmission and distribution of electricity— (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts.	proposed substation / collector switching stations will be located outside urban areas and will have capacities of 33/132kV respectively.
12 (ii) (a) (c)	**GN R. 327 (as amended) Item 12:** The development of: ii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs- (a) within a watercourse; (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse.	The proposed developments will therefore entail the construction of infrastructure with physical footprints of approximately 100m^2 or more within a surface water feature / watercourse or within 32m of a surface water feature / watercourse.
14	**GN R. 327 (as amended) Item 14:** The development and related operation of facilities or infrastructure, for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 cubic metres or more but not exceeding 500 cubic metres.	"Dangerous goods" that are likely to be associated with the project include fuel stored during the construction phase and/or hazardous chemical substances at the substation during the operational phase. Threshold of 80 m^3 expected to be exceeded. The proposed development will include the construction of an on-site Battery Energy Storage System (BESS) using solid state / liquid flow or redox flow batteries with hazardous material of more than 80m^3.
19	**GN R. 327 (as amended) Item 19:** 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;	The proposed development will involve the excavation, removal, infilling, depositing and moving of more than 10 cubic metres (m^3) of soil, sand, pebbles or rock from some of the identified surface water features / watercourses. Although the layout of the proposed development will be designed to avoid the identified surface water features / watercourses as far as possible, some of the internal and/or access roads may need to traverse the identified surface water features / watercourses. In addition, during construction of these roads, soil may need to be removed from some of the identified surface water features / watercourses.
24 (ii)	**GN R. 327 (as amended) Item 24:** The development of a road - ii) with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres.	Internal roads will be required to access the PV panels and substations. Existing roads will be used wherever possible, although new roads will be constructed where necessary.
28 (ii)	**GN R. 327 (as amended) Item 28:** Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture,	The total area to be developed for the proposed renewable energy facilities is greater than 1ha and occurs outside an urban area in an area currently zoned as agriculture land.

Activity No(s):	Relevant activities as set out in Listing Notices 1, 2 and 3 of the EIA Regulations, 2014 as amended	Describe the portion of the proposed project to which the applicable listed activity relates.
	game farming, equestrian purposes or afforestation on or after 01 April 1998 and where such development: (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare;	
48 (i) (a) (c)	**GN R. 327 (as amended) Item 48: The expansion of-** (i) infrastructure or structures where the physical footprint is expanded by 100 square metres or more; where such expansion occurs— (a) within a watercourse; or (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse;	The proposed project will most likely entail the expansion (upgrading) of roads and other infrastructure by 100m^2 or more within a surface water feature / watercourse or within 32 m from the edge of a surface water feature / watercourse. Although the layout of the proposed development will be designed to avoid the identified surface water features / watercourses as far as possible, some of the infrastructure (e.g. internal and access roads, etc) to be upgraded will likely need to traverse the identified surface water features / watercourses and construction will likely occur within some of the surface water features / watercourses and/or be within 32m of some of the surface water features / watercourses.
56 (ii)	**GN R. 327 Item 56:** The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre - (ii) where no reserve exists, where the existing road is wider than 8 metres –	Internal access roads will be required to access the PV panels and the substation. Existing roads will be used wherever possible, although new roads will be constructed where necessary. The existing access roads might thus need to be upgraded by widening them more than 6m, or by lengthening them by more than 1km.
Relevant Scoping and EIA Activities as set out in Listing Notice 2 of the EIA Regulations, 2014 as amended		
1	**GN R. 325 (as amended) Item 1:** The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more.	The proposed development will entail the construction of a PV where the electricity output will be approximately 50MW. In addition, the proposed PV development will be located outside urban area.
15	**GN R. 325 (as amended) Item 15:** The clearance of an area of 20 hectares or more of indigenous vegetation.	The proposed SEF development will involve the clearance of more than 20ha of indigenous vegetation. Clearance will also be required for the proposed on-site substation, BESS, internal roads and other associated infrastructure.
Relevant Basic Assessment Activities as set out in Listing Notice 3 of the EIA Regulations, 2014 as amended		
4 i. (ii) (aa)	**GN R. 324 (as amended) Item 4:** The development of a road wider than 4 metres with a reserve less than 13,5 metres. **f. Mpumalanga** i. Outside urban areas; (bb) National Protected Area Expansion Strategy Focus areas; (ee) Critical biodiversity areas as identified in systematic biodiversity plans	The development of the SEF facilities and associated infrastructure is likely to require the development of roads wider than 4m with a reserve of less than 13.5m within CBA and NPAES areas. These roads will occur within the Mpumalanga Province, outside urban areas.

Activity No(s):	Relevant activities as set out in Listing Notices 1, 2 and 3 of the EIA Regulations, 2014 as amended	Describe the portion of the proposed project to which the applicable listed activity relates.
	adopted by the competent authority or in bioregional plans;	
10.	**GN R. 324 (as amended) Item 10:** The development and related operation of facilities or infrastructure, for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 cubic metres or more but not exceeding 500 cubic metres. **(f) In Mpumalanga** (i) Outside urban areas; (ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;	The development of the onsite substation will require the construction and operation of facilities and infrastructure for the storage and handling of dangerous goods (combustible and flammable liquids, such as oils, lubricants, solvents) such storage will occur inside containers with a combined capacity exceeding 80 cubic meters but not exceeding 500 cubic meters within areas classified as CBAs.
12 (f) (ii)	**GN R. 324 (as amended) Item 12:** The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan. **(f) In Mpumalanga** (ii) Within critical biodiversity areas identified in bioregional plans;	The proposed SEF development will involve the clearance of more than 300m^2 or more of indigenous vegetation within CBA. Clearance will also be required for the proposed on-site substation, BESS, internal roads and other associated infrastructure.
14 ii. a.c.f.i.bb. ff	**GN R. 324 (as amended) Item 14:** The development of: ii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs- (a) within a watercourse; (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse. **(f) In Mpumalanga** i. Outside urban areas: (bb) National Protected Area Expansion Strategy Focus areas; (ff) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans	The proposed development will likely entail the development of infrastructure with physical footprints of 10m^2 or more within a watercourse / surface water feature or within 32m from the edge of a watercourse / surface water feature. Although the layouts of the respective proposed developments will be designed to avoid the identified surface water features / watercourse as far as possible, some of the infrastructure / structures will likely need to traverse the identified surface water features / watercourses. The construction of the infrastructure for the development will occur within CBA and NPAES areas. These infrastructures will occur within the Mpumalanga Province, outside urban areas.

Activity No(s):	Relevant activities as set out in Listing Notices 1, 2 and 3 of the EIA Regulations, 2014 as amended	Describe the portion of the proposed project to which the applicable listed activity relates.
18 f. i. (bb) (ee)	**GN R. 324 (as amended) Item 18:** The widening of a road by more than 4 meters, or the lengthening of a road by more than 1 kilometer- **f. Mpumalanga** i. Outside urban areas: (bb) National Protected Area Expansion Strategy Focus areas; (ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;	Access roads will be required to access the PV panels as well as the substation. Existing roads will be used wherever possible. Internal access roads will thus likely be widened by more than 4m or lengthened by more than 1km. These roads will occur within CBA and NPAES areas, within the Mpumalanga province and outside urban areas
23 (ii) (a) (c); f. i. (ff	**GN R. 324 (as amended) Item 23:** The expansion of – (ii) infrastructure or structures where the physical footprint is expanded by 10 square metres or more; where such expansion occurs – (a) within a watercourse; (c) if no development setback has been adopted adopted, within 32 metres of a watercourse, measured from the edge of a watercourse; **f. Mpumalanga** i. Outside urban areas: (bb) National Protected Area Expansion Strategy Focus areas; (ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;	The proposed development will entail the development and expansion of roads by 10m^2 or more within a watercourses or within 32m from the edge of a watercourses. The proposed development will be located outside an urban area and within CBA and NPAES areas, within the Mpumalanga province and outside urban areas.

5. LOCATION OF THE ACTIVITY

5.1 Regional Locality

The proposed development is located approximately 13 km south-west of Belfast, within the Emakhazeni Local Municipality in the Nkangala District Municipality of the Mpumalanga Province (**Figure 4**).

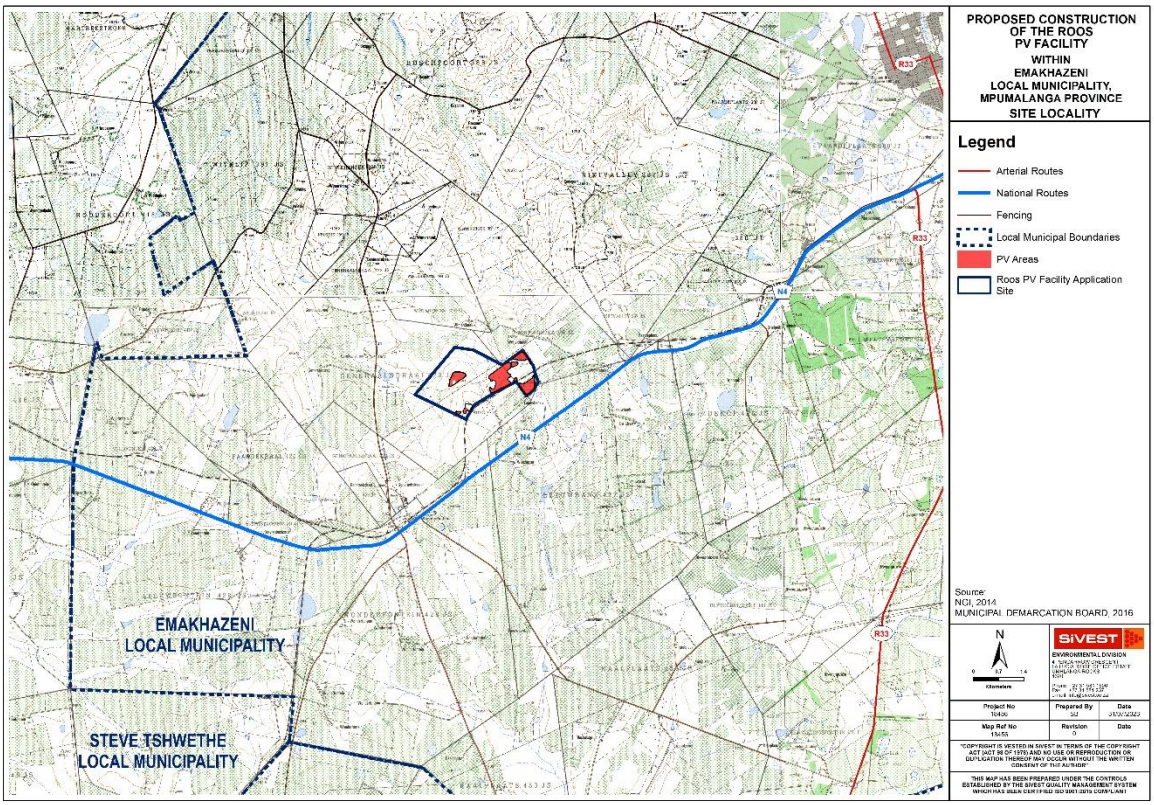

Figure 4: Site Locality

5.2 Summary of affected properties (including SG codes and Farm Names)

Table 8: Summary of affected properties (including SG Codes and Farm Names)

21 Digit Surveyor General Code	Description	Portion No.	Farm No.	Farm Name
T0JS00000000042300014	Portion 14 of the Farm Generaalsdraai No 423	14	423	Generaalsdraai
T0JS00000000039000008	Portion 8 of the Farm Wintershoek nr 390, JS	8	390	Wintershoek

5.3 Coordinates of the site

Table 9: SEF Coordinates – Application site

ROOS: SEF		
COORDINATES AT CENRE POINTS (DD MM SS.sss)		
Site	**SOUTH**	**EAST**
1	25°46'17.022"S	29°54'48.564"E
COORDINATES AT CORNER POINTS (DD MM SS.sss)		
1	25°46'30.806"S	29°53'52.869"E

2	25°28'46.188"S	29°54'32.07"E
3	25°45'51.268"S	29°54'49.33"E
4	25°46'5.215"S	29°55'19.513"E
5	25°45'51.404"S	29°55'40.109"E
6	25°46'5.892"S	29°55'50.331"E
7	25°46'19.851"S	29°55'54.49"E
8	25°46'27.578"S	29°55'50.331"E
9	25°46'32.285"S	29°55'43.084"E
10	25°46'20.047"S	29°55'33.263"E
11	25°46'28.556"S	29°55'13.431"E
12	25°46'40.534"S	29°54'50.432"E
13	25°46'28.556"S	29°54'42.719"E

Table 10: Grid connection coordinates

ROOS GRID: GRID CORRIDOR (PREFERRED)		
COORDINATES AT CORNER POINTS (DD MM SS.sss)		
POINT	**SOUTH**	**EAST**
1	25° 46' 1.127" S	29° 55' 11.302" E
2	25° 46' 3.017" S	29° 55' 15.879" E
3	25° 46' 4.851" S	29° 55' 12.977" E
4	25° 46' 2.990" S	29° 55' 8.432" E
ROOS GRID: GRID CORRIDOR (ALTERNATIVE)		
COORDINATES AT CORNER POINTS (DD MM SS.sss)		
1	25° 46' 37.125" S	29° 54' 13.300" E
2	25° 46' 35.040" S	29° 54' 16.109" E
3	25° 46' 39.001" S	29° 54' 19.379" E
4	25° 46' 40.497" S	29° 54' 16.542" E

Table 11: On-site Substation Coordinate

ROOS SEF: SUBSTATION (PREFERRED)		
COORDINATES AT CORNER POINTS (DD MM SS.sss)		
Point	**SOUTH**	**EAST**
1	25° 46' 3.162" S	29° 55' 15.796" E
2	25° 46' 4.876" S	29° 55' 19.485" E
3	25° 46' 6.634" S	29° 55' 17.047" E
4	25° 46' 4.859" S	29° 55' 13.048" E
ROOS SEF: SUBSTATION (ALTERNATIVE)		
COORDINATES AT CORNER POINTS (DD MM SS.sss)		
1	25° 46' 39.973" S	29° 54' 16.062" E
2	25° 46' 38.300" S	29° 54' 18.718" E
3	25° 46' 41.168" S	29° 54' 21.174" E
4	25° 46' 42.828" S	29° 54' 18.713" E

Table 12: Laydown area, BESS & O&M Area Coordinates

ROOS SEF: LAYDOWN AREA, BESS & O&M AREA (PREFERRED)		
COORDINATES AT CORNER POINTS (DD MM SS.sss)		
Point	**SOUTH**	**EAST**
1	25° 46' 7.840" S	29° 55' 6.471" E
2	25° 46' 4.662" S	29° 55' 12.058" E
3	25° 46' 6.783" S	29° 55' 16.821" E
4	25° 46' 14.112" S	29° 55' 5.154" E
ROOS SEF: LAYDOWN AREA, BESS & O&M AREA (ALTERNATIVE)		
COORDINATES AT CORNER POINTS (DD MM SS.sss)		
1	25° 46' 40.441" S	29° 54' 13.216" E
2	25° 46' 39.328" S	29° 54' 15.273" E
3	25° 46' 45.939" S	29° 54' 25.488" E
4	25° 46' 44.331" S	29° 54' 23.883" E
5	25° 46' 38.004" S	29° 54' 23.851" E
6	25° 46' 34.548" S	29° 54' 22.728" E
7	25° 46' 37.309" S	29° 54' 18.348" E

5.4 Study Area Description

The geology broadly forms part of the Pretoria Group, with the Dullstroom, Steenkampsberg, Lakenvlei, Vermont, Magaliesberg, Silverton, Strubenkop, Daspoort, Hekpoort, and Timeball Hill Formations running from the west through to the east. The Pretoria Group is commonly intersected by the intrusive Transvaal Diabase in the form of dykes and sills. The resulting rocks are predominantly comprised of quartzite, shale, dolerite, diabase and basalt.

Soils are shallow to deep, well-drained; either dystrophic and/or mesotrophic, depending on geology. Soil derived from quartzite results in sandy, white dystrophic soils with high humus content. This region is characterised by strongly seasonal summer rainfall, with very dry winters. Mean annual precipitation (MAP) 650–900 mm (overall average: 726 mm), MAP relatively uniform across most of this unit, but increases significantly in the extreme southeast. The coefficient of variation in MAP is 25% across most of the unit but drops to 21% in the east and southeast. Incidence of frost from 13–42 days, but higher at higher elevations. The regional climate capability was classified as Moderate (Mucina, et al., 2006).

A summary of the specialist findings and recommendations is attached in **Appendix D**.

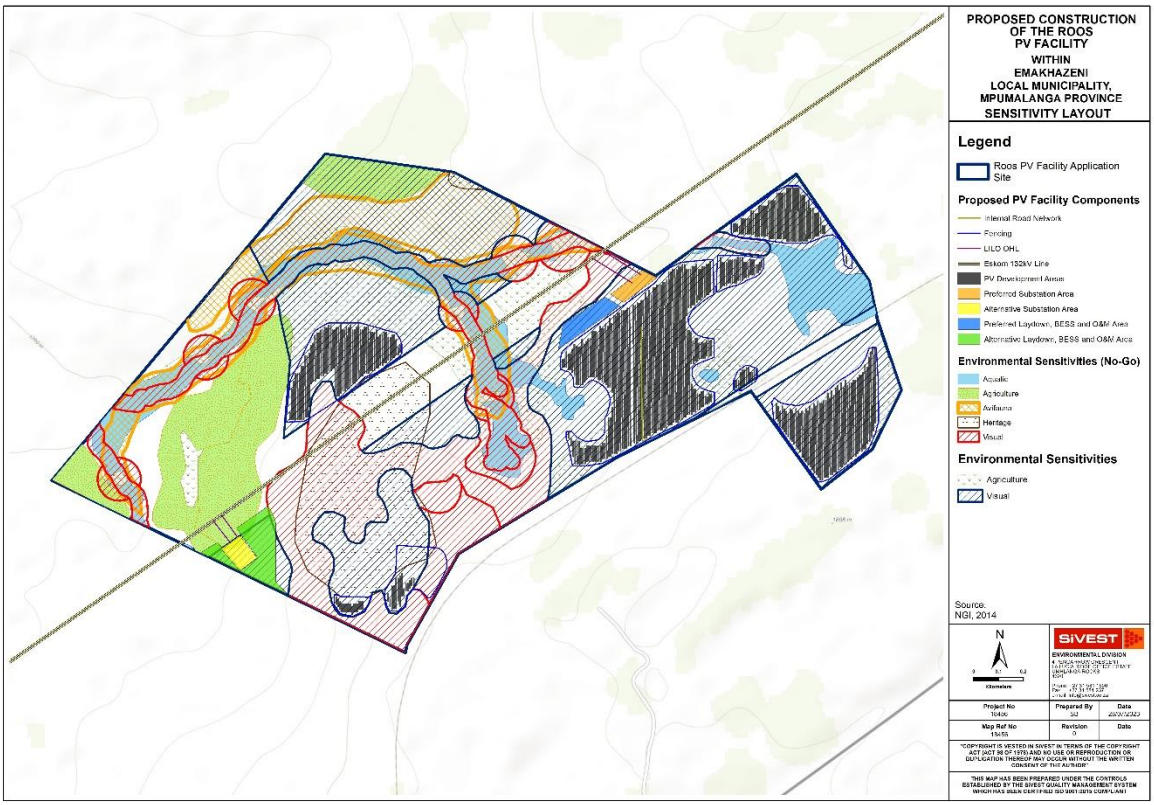

Figure 5: Proposed Layout with Sensitivity Overlay

6. ENVIRONMENTAL MANAGEMENT PROGRAMME

6.1 Introduction

The Environmental Management Programme (EMPr) has been prepared in order to comply with the requirements as stipulated in the National Environmental Management Act (No. 107 of 1998).

This EMPr includes:

- Details and expertise of the EAP who prepared the EMPr including curriculum vitae;
- Project Description;
- Facility Illustration Plans;
- Mitigation measures as contained in the Impact Assessment Report;
- Recommendations and conclusions emanating from the specialist studies;
- Impact Management Objectives and Actions; and
- A copy of the EA (if granted).

6.2 Aim and Objectives of the EMPr

The aim of the EMPr is to:

- Identify those construction activities identified for the proposed development that may have a negative impact on the environment;
- Outline the mitigation measures that will need to be taken and the steps necessary for their implementation;
- Describe the reporting system to be undertaken during construction.

The objectives of the EMP are to:

- Identify a range of mitigation measures which could reduce and mitigate the potential adverse impacts to minimal or insignificant levels.
- Provide a pro-active, feasible and practical working tool to enable the measurement and monitoring of environmental performance on site.
- Provide management structures that address the comments raised by I&APs pertaining to the development.
- Ensure that the environmental specifications are identified, effective and contractually binding so as to enable compliance on site.

6.3 Layout of the EMPr

The EMPr identifies the four phases of development as:

- Preconstruction Planning Phase Activities (Section 9.1)
- Construction Phase Activities (Section 9.2)
- Operation Phase Activities (Section 9.3)
- Decommissioning Phase Activities (Section 9.4)

The generic and specific provisions are included together under each phase for each environmental consideration. The generic provisions are the general environmental issues, procedures and controls that can be applied to the project and site as a whole. The specific provisions are those environmental issues, procedures and controls that are relevant to a particular section of the site. It should be understood that the EMP is considered an evolving document and may be amended at any time by the relevant authorities (DFFE, DWS etc.).

7. LEGAL AND OTHER REQURIEMENTS

7.1 Compliance with Applicable Laws

The supreme law of the land is “The Constitution of the Republic of South Africa”, which states: “*Every person shall have the right to an environment which is not detrimental to his or her health or wellbeing*”. Laws applicable to the protection of the environment in terms of Environmental Management (and relating to construction activities) include but are not restricted to:

- Animals Protection Act, Act No. 71 of 1962
- Astronomy Geographic Advantage (Act No. 21 of 2007)
- Civil Aviation Act (Act No.13 of 2009)
- Conservation of Agricultural Resources Act, Act No. 43 of 1983
- Development Facilitation Act No. 67 of 1995
- Environment Conservation Act, Act No. 73 of 1989
- Environmental Planning Act, Act No. 88 of 1967
- Hazardous Substances Act, Act No. 15 of 1973
- Land Survey Act, Act No. 9 of 1921
- Minerals Act, Act No. 50 of 1991
- National Environmental Management: Air Quality Act, Act No. 39 of 2004);
- National Environmental Management: Biodiversity Act, Act No. 10 of 2004, as amended)
- National Environmental Management Act, Act No.107 of 1998
- NEMA EIA Regulations, 2014 (as amended)
- National Environmental Management: Protected Areas Act (NEM: PAA) (Act No. 57 of 2003, as amended)
- National Environmental Management: Waste Act, Act No. 59 of 2008
- National Forests Act (NFA) (Act No. 84 of 1998)
- The National Heritage Resources Act, Act No. 25 of 1999
- National Water Act, Act No. 36 of 1998
- National Dust Control Regulations (GN No. R. 827 of 1 November 2013
- National Road Traffic (Act No. 93 of 1996, as amended)
- Occupational Health and Safety Act, Act No. 85 of 1993
- Provincial and Local Government Ordinances and Bylaws
- Soil Conservation Act, Act No. 76 of 1969
- Subdivision of Agricultural Land (Act No. 70 of 1970, as amended)
- Water Services Act, Act No. 108 of 1997

Several regulations will be applicable to the construction phase of the project. These guidelines are mentioned in the EMPr tables. The EMPr forms part of the Contract Documentation and is thus is a legally binding document.

7.2 Compliance with the Environmental Management Programme

A copy of the EMPr must be kept on site during the construction period at all times. The EMPr will be made binding on all contractors operating on the site and will be included within the Contractual Clauses. Non-compliance with, or any deviation from, the conditions set out in this document constitutes a failure in compliance with the Environmental Authorisation (EA) issued by DFFE.

It should be noted that in terms of Section 28 of the National Environmental Management Act (NEMA) Act No. 107 of 1998, those responsible for Environmental Damage must pay the repair costs both to the environment and human health and the preventative measures to reduce or prevent further pollution and/or environmental damage. (The polluter pays principle).

In terms of the EA, non-compliance of the EA may result in invalidation of the EA, criminal prosecution or other actions provided for in the NEMA (as amended) and associated regulations. Any non-compliance must result in an immediate stop to works being issued. The contractor and developer will be held liable for any damage and consequent rehabilitation to environmentally sensitive areas outside

the site boundary. In the event of any dispute concerning the significance of a particular impact, the opinion of DFFE in respect of its significance will prevail.

National government, provincial government, local authorities or committees appointed in terms of the conditions of the EA or any other public authority shall not be held responsible for any damages or losses suffered by the authorisation holder or successor in title in any instance where construction or operation subsequent to construction is temporarily or permanently stopped for reasons of non-compliance by the authorisation holder with the conditions of authorisation as set out in this document or any subsequent document emanating from these conditions of authorisation.

7.3 Specific Conditions Pertaining to Authorisations

Should the Department of Forestry, Fisheries and the Environment (DFFE) issue an Environmental Authorisation (EA), this EMPr will be updated to include any additional pre-construction, construction, operation and decommissioning conditions stipulated in the EA not already included below.

A water use license will be applied for and may become applicable to the proposed project at a later stage.

Specific conditions pertaining to regulatory processes, or Licensee / Holder of the Authorisation requirements, have not been included within the EMPr and will only be included on finalization of the EMPr (pending decision). These conditions are to be undertaken by the Licensee / Holder of the Authorisation prior to the commencement of construction.

8. PROJECT RESPONSIBILITIES

8.1 Responsible Parties and associated roles

As described above, **Table 13** below provides a summary of the responsible parties and the auditing process to be carried out.

Table 13: Responsible Parties and Auditing Process

TITLE	PARTY	ROLE DURING CONSTRUCTION	ROLE DURING OPERATION
Project Developer (Proponent)	JUWI Renewable Energies (Pty) Ltd	Assume ultimate responsibility	Assume ultimate responsibility
Project Manager	To be appointed by proponent	Project management	N/A
Contractor's Project Manager	Balance of Plant Contractor	Construction management	N/A

TITLE	PARTY	ROLE DURING CONSTRUCTION	ROLE DURING OPERATION
Main Contractor/s	There will be multiple contracts placed for the construction phase. These will cover civil earthworks and concrete, structural mechanical and electrical / instrumentation. There could also be the construction camp management contract. These may be managed by the Contractor's Project Manager (or other).	Main Contractor will undertake day to day construction activities covering aspects such as civil earthworks and concrete, structural mechanical and electrical / instrumentation.	N/A
Environmental Officer	To be appointed by Main Contractors	Day to day environmental responsibility, point of contact for Environmental Control Officer (ECO)	N/A
Environmental Control Officer	To be appointed by Project developer	Monthly audits	Annual audits
Competent Authority	National Department of Forestry, Fisheries and the Environment (DFFE)	Conduct site visits when necessary.	Conduct site visits when necessary

The above may be updated based on the outcome of the Environmental process should additional responsibilities be identified.

9. IMPACT MANAGEMENT ACTIONS AND OUTCOMES

9.1 Pre-construction Phase

9.1.1 Site preparation

This section deals with the issues relative to site preparation during the pre-construction phase.

Table 14: Site preparation

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES
Appointment of ECO	• Appoint an ECO. • The ECO or a responsible appointed person or site manager should contact a bird specialist before construction commences so that they know what to look out for during construction.	Holder of the EA	Undertake regular audits	Avoid construction delays. Ensure the EMPr is adhered to.	Continuous
Site demarcation	• Before construction begins, all areas to be developed must be clearly demarcated with fencing or orange construction barrier where applicable. • All Construction Camps are to be fenced off in such a manner that unlawful entry is prevented, and access is controlled. All access points to the Construction Camp should be controlled by a guard or otherwise monitored, to prevent unlawful access.	Contractor	Undertake regular audits	Prevent unauthorized impact on the environment. Ensure safety of the workers, public and prevent loss/ damage to equipment. Ensure the conditions of the EA are adhered to.	Continuous

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES
				Compliance to all legislative requirements	
Site clearing	• Site clearing must take place in a phased manner, as and when required. • Areas which are not to be constructed on within two months must not be cleared to reduce erosion risks. • The area to be cleared must be clearly demarcated and this footprint strictly maintained. • Spoil that is removed from the site must be removed to an approved spoil site or a licensed landfill site. • The necessary silt fences and erosion control measures must be implemented in areas where these risks are more prevalent. • Storm water must be managed in such a manner as to disperse runoff and to prevent the concentration of storm water flow.	Holder of the EA/Contractor	Undertake regular audits	Site establishment undertaken responsibly. Sensitive areas identified and avoided. Erosion management plan implemented and hydrological measures in place.	Once off
Construction Camp	• Site establishment shall take place in an orderly manner and all required amenities shall be installed at camp sites before the main workforce move onto site. • All construction equipment must be stored within the construction camp. • All associated oil changes etc. (no servicing) must take place within the camp over a sealed surface such as a concrete slab. • An area for the storage of hazardous materials must be established that conforms to the relevant safety requirements and that provides for spillage prevention and containment.	Contractor	Undertake regular audits	Prevent unauthorized impact on the environment. Ensure safety of the public and prevent loss/ damage equipment. Ensure EMP is adhered to.	Continuous

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES
	• All Construction Camps shall be provided with portable fire extinguishing equipment, in accordance with all relevant legislation and must be readily accessible. • The Contractor must provide sufficient ablution facilities, in the form of portable / VIP toilets, at the Construction Camps, and shall conform to all relevant health and safety standards and codes. No pit latrines, French drain systems or soak away systems shall be allowed, and toilets may not be situated within 100 meters of any surface water body or 1:100-year flood line. • The Contractor shall inform all site staff to make use of supplied ablution facilities and under no circumstances shall indiscriminate sanitary activities be allowed. • No fires will be allowed, and the Contractor must make alternative arrangements for heating. LP Gas may be used, provided that all required safety measures are in place. The Contractor shall take specific measures to prevent the spread of fires, caused by activities at the campsites. These measures may include appropriate instruction of employees about fire risks and the construction of firebreaks around the site perimeter.			Compliance to all legislative requirements	
Training of site staff	• Environmental awareness training for construction staff, concerning at a minimum the general environmental awareness, conservation of fauna and flora, the prevention of accidental spillage of hazardous chemicals and oil; pollution of water resources (both surface and groundwater), air pollution and litter control and identification of archaeological artefacts.	Contractor	Undertake regular audits	All staff members are aware of the EMPr requirements relevant to them. All waste managed according to approve the Method Statement	Continuous

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES
	• Staff operating equipment (such as loaders, etc.) shall be adequately trained and sensitised to any potential hazards associated with their tasks. • No operator shall be permitted to operate critical items of mechanical equipment without having been trained by the Contractor and certified competent by the Project Manager. • Staff should be educated as to the need to refrain from indiscriminate waste disposal and/or pollution of local soil and water resources and receive the necessary safety training. • Staff must be trained in the hazards and required precautionary measures for dealing with these substances. • Spillage packs must be available at construction areas.			compiled by the contractor and approved by the engineer and reviewed by ECO	

9.1.2 Consultation

This section deals with the issues relative to consultation during the pre-construction phase.

Table 15: Consultation

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES
Consultation	• Provide a mechanism through which information could be exchanged between the project proponent and stakeholders. • Identify relevant stakeholders and engage them at applicable stages of the process.	Holder of the EA/ Contractor	Clear communication channels established.	Continuous

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES
	• Inform the public about the proposed construction process. • Surrounding communities must be kept informed, through the identified and agreed consultation channels, of the commencement of construction. • Work on site to be restricted to work hours. • Financial provision must be included for rehabilitation in terms of the Renewable Independent Power Producer Programme (REIPPP) financial model requirements. • An agreement/contract should be formalised between the landowner and the applicant, that will ensure that the rehabilitation does not leave any liability to future landowners.			

9.1.3 Agriculture

This section deals with the issues relative to agriculture during the pre-construction phase.

Table 16: Agriculture

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
Site clearance and topsoil removal prior to the commencement of physical construction activities.	• Ensure proper storm water management designs are in place; • If any erosion occurs, corrective actions (erosion berms) must be taken to minimize any further erosion from taking place;	Applicant Contractor • ECO	As prescribed by the Mitigation measures.	Prevent soil erosion and the loss of soil as a valuable resource	Ongoing

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
The construction of stockpiles	• If erosion has occurred, topsoil should be sourced and replaced and shaped to reduce the recurrence of erosion; • Only the designated access routes are to be used to reduce any unnecessary compaction; • Compacted areas are to be ripped to loosen the soil structure; • The topsoil should be stripped by means of an excavator bucket, and loaded onto dump trucks; • Topsoil stockpiles are to be kept to a maximum height of 4m; • Topsoil is to be stripped when the soil is dry, as to reduce compaction; • Bush clearing contractors will only clear bushes and trees larger than 1m the remaining vegetation will be stripped with the top 0.3 m of topsoil to conserve as much of the nutrient cycle, organic matter, and seed bank as possible (only after alien vegetation has been removed); • The subsoil approximately 0.3 – 0.6 m thick will then be stripped and stockpiled separately; • The handling of the stripped topsoil will be minimized to ensure the soil's structure does not deteriorate significantly;				

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
	• Compaction of the removed topsoil must be avoided by prohibiting traffic on stockpiles; • Topsoil stockpiles should only be used for the rehabilitation of the area; • The stockpiles will be vegetated in order to reduce the risk of erosion, prevent weed growth and to reinstitute the ecological processes within the soil. • Prevent any spills from occurring. Machines must be parked within hard park areas and must be checked daily for fluid leaks; • If a spill occurs, it is to be cleaned up immediately and reported to the appropriate authorities; • All vehicles are to be serviced in a correctly bunded area or at an off-site location; • Leaking vehicles will have drip trays place under them where the leak is occurring;				

9.1.4 Transport

This section deals with the issues relative to transport during the pre-construction phase.

Table 17: Transport

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/FREQUENCY
Increase in road traffic	• Identify type and condition of affected roads	Developer	Transportation study	Establish baseline	Once-off
	• Deduce current traffic	Developer	Transportation study	Establish baseline conditions	Once-off
	• Deduce expected additional traffic	Developer	Transportation study	Understand extent of impact	Once-off
	• Confirm ability of existing road network to absorb additional traffic	Developer	Transportation study	Ensure containment of impact	Once-off
Increase in traffic incidents with pedestrians and livestock	• Assess current pedestrian conditions	Developer	Transportation study	Establish baseline	Once-off
	• Confirm ability of existing road network to safely accommodate pedestrians	Developer	Transportation study	Ensure containment of impact	Once-off
Traffic disruptions and road damage due to abnormal loads	• Identify required abnormal loads	Developer	Transportation study; Abnormal Load Study	Understand extent of impact	Monthly
	• Identify suitable routes	Developer	Transportation study;	Ensure containment of impact	Once-off
	• Apply for abnormal load permits with the relevant authorities	Developer	Application	Ensure containment of impact	Once-off

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/FREQUENCY
Access and internal roads	• Assess suitability of existing accesses and internal roads	Developer	Transportation study	Establish baseline	Once-off
	• Design accesses and internal roads as per applicable criteria and standards	Developer	Civil engineering design	Ensure containment of impact	Once-off
	• Design access and internal roads to minimise earthworks	Developer	Civil engineering design	Reduction of environmental disturbance	Once-off
	• Design access and internal roads to minimise stormwater damage	Developer	Civil engineering design	Reduction of environmental disturbance	Once-off
	• Submit access and road designs for approval with relevant authorities prior to construction	Developer	Application	Ensure compliance	Once-off

9.1.5 Aquatic

This section deals with the issues relative to aquatic during the pre-construction phase.

Table 18: Aquatic

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
Impacts to hydrological function at a landscape level	• During the detailed design phase, the footprint and design of structures (Including Pylons and Solar Structures) should aim to have the least impact on habitat quality and hydrology of the watercourse.	ECO	Construction Monitoring and Preventative Measures	Best practice, limiting harm as per National Environmental Management Act No. 107 of 1998	Pre- Construction

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
	• Design should take into account soil properties, slopes and runoff energy. • Where possible Demarcate the watercourse areas and buffer zones to limit disturbance, clearly mark these areas as no-go areas • Project engineers should compile a method statement, outlining the construction methodologies. The required mitigation measures to limit the impacts on the watercourse and associated buffers should be contained within the method statement. The method statement must be approved by the ECO and be available on site for reference purposes				
Sedimentation	• Consider the various methods and equipment available and select whichever method(s) that will have the least impact on watercourses. • Remove only the vegetation where essential for construction and do not allow any disturbance to the adjoining natural vegetation cover.	Developer and Contractor	Preventative	Best practice, limiting harm as per National Environmental Management Act No. 107 of 1998	Pre- Construction
Introduction and spread of alien vegetation.	• Undertake an Alien Plant Control Plan which specifies actions and measurable targets	Developer and Contractor	Construction Monitoring and Preventative Measures	Best practice, limiting harm as per National Environmental Management Act No. 107 of 1998	Pre- Construction

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
Loss and disturbance of watercourse habitat and fringe vegetation.	• The development footprint should remain outside the delineated watercourses areas and buffer zones. Where this is unavoidable a Watercourse offset plan and/or a Water use licence should be developed and authorised. This should be discussed with the relevant authorities, and if deemed necessary an offset plan should be developed and approved. • Where possible Demarcate the watercourse areas and buffer zones to limit disturbance, clearly mark these areas as no-go areas • Implement an Alien Plant Control Plan • Conduct thorough vegetation surveys and assessments before construction to identify sensitive habitats, watercourses, and fringe vegetation. Use this information to inform design decisions and avoid or minimise impacts to these areas. • Carefully plan the solar plant layout to avoid or minimize the disturbance of watercourses and sensitive fringe vegetation.	Developer and Contractor	Preventative	Best practice, limiting harm as per National Environmental Management Act No. 107 of 1998	Pre-Construction
Changes in water quality	• Where possible Locate the infrastructure outside the calculated buffer zone. Where designs do not allow for changes a watercourse offset plan and/or a Water use licence should be developed and authorised. This should be discussed with	Developer and Contractor	Preventative	Best practice, limiting harm as per National Environmental Management Act No. 107 of 1998	Pre- Construction

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
	the relevant authorities, and if deemed necessary an offset plan should be developed and approved. • Provision of adequate sanitation facilities located outside of the watercourse area or its associated buffer zone • The development footprint must be fenced off from the watercourses and where possible for the non-perennial watercourses and no related impacts may be allowed into the watercourse e.g. water runoff from cleaning of equipment, vehicle access etc.				
Loss of aquatic biota	• Avoid unnecessary aquatic ecosystem crossing - limit work within the stream, river or wetland. The use of single access points for crossings. • The Structure currently located either within a wetland or within the buffer of a wetland should be moved. • Other than approved and authorised structure, no other development or maintenance infrastructure is allowed within the delineated watercourse or its associated buffer zones. • Mark all areas which don't form part of the proposed development within the watercourse as no-go areas. • Incorporation of phytoremediation into the storm water attenuation systems to	Developer and Contractor	Preventative	Best practice, limiting harm as per National Environmental Management Act No. 107 of 1998	Pre- Construction

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
	facilitate nutrient reduction, sediment regime control and manage toxicants releases.				

9.1.6 Terrestrial

This section deals with the issues relative to terrestrial during the pre-construction phase.

Table 19: Terrestrial

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
Vegetation Loss	• Blanket clearing of vegetation must be limited to the site. No clearing outside of footprint to take place. • The boundaries of the development footprint areas are to be clearly demarcated and it must be ensured that all activities remain within the demarcated footprint area. • Topsoil must be striped and stockpiled separately during site preparation and replaced on completion where revegetation will take place. • Erosion prevention is key thus runoff must be controlled and managed by use of proper stormwater management measures. • Any site camps and laydown areas requiring clearing must be located within	Developer and Contractor	N/A	To minimise vegetation loss	Planning and Design phase prior to construction commencing

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
	already disturbed areas away from sensitive areas.				

9.2 Construction Phase

9.2.1 Construction Camp

This section deals with the issues relative to the construction camp during the construction phase.

Table 20: Construction Camp

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	IMPACT MANAGEMENT OUTCOMES	TIMEFRAME
Construction Camp: Site of construction camp	• The size of the construction camp must be aligned to the approved laydown area. • Adequate parking must be provided for site staff and visitors. The Contractor must attend to drainage of the camp site to avoid standing water and / or sheet erosion. • Suitable control measures over the Contractor's yard, plant and material storage to mitigate any visual impact of the construction activity must be implemented. • No construction should occur in an area of high or unique agricultural value, or in an area under cultivation.	Holder of the EA/Contractor	Ensure the conditions of the EA are adhered to. Compliance to all legislative requirements. Impacts avoided or managed as per specialist recommendations.	Once-off
Construction Camp: Storage of materials (including	• Choice of location for storage areas must take into account prevailing winds, distances to water bodies, general onsite topography and water	Holder of the EA/Contractor	Choice of storage areas carefully considered to avoid	Continuous

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

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	IMPACT MANAGEMENT OUTCOMES	TIMEFRAME
	• Staff dealing with these materials / substances must be aware of their potential impacts and follow the appropriate safety measures. • An approved waste disposal contractor must be employed to remove and recycle waste oil, if practical. The contractor must ensure that its staff is made aware of the health risks associated with any hazardous substances used and has been provided with the appropriate protective clothing/equipment in case of spillages or accidents and have received the necessary training. • All excess cement and concrete mixes are to be contained on the construction site prior to disposal off site. • All major spills as specified in the contractor emergency response procedure of any materials, chemicals, fuels or other potentially hazardous or pollutant substances must be cleaned immediately, and the cause of the spill investigated. Preventative measures must be identified and submitted to the MC and ECO for information. Emergency response procedures to be followed and implemented.			
Construction Camp: Drainage of construction camp	• Surface drainage measures must be established in the Construction Camps so as to prevent – Ponding of water; – Erosion as a result of accelerated runoff; and, – Uncontrolled discharge of polluted runoff.	Holder of the EA/Contractor	Appropriate stormwater structures Storm Water Management Plan implemented. Erosion plan implemented and hydrological measures in place.	Continuous

9.2.2 Environmental Education and Training

This section deals with the issues relative to environmental education and training during the construction phase.

Table 21: Environmental Education and Training

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES
Environmental Education and Training: Environmental Training	• Ensure that all site personnel have a basic level of environmental awareness training. The Contractor must submit a proposal for this training to the ECO for approval. Translators are to be used where necessary. Topics covered should include: o What is meant by "Environment" o Why the environment needs to be protected and conserved o How construction activities can impact on the environment o What can be done to mitigate against such impacts o Awareness of emergency and spills response provisions o Social responsibility during construction e.g. being considerate to local residents • It is the Contractor's responsibility to provide the site foreman with adequate environmental training and to ensure that the foreman has sufficient understanding to pass this information onto the construction staff. • Training should be provided to the staff members in the use of the appropriate fire-fighting equipment. • The need for a "clean site" policy also needs to be explained to the workers. • Staff operating equipment (such as loaders, etc.) shall be adequately trained and sensitized to any potential hazards associated with their tasks.	Contractor	Thorough induction to site.	Continuous
Environmental Education and	• The Contractor must monitor the performance of construction workers to ensure that the points relayed during their introduction have been	Contractor	Thorough induction to site.	Continuous

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES
Training: Monitoring of environmental training	properly understood and are being followed. If necessary, the ECO and / or a translator should be called to the site to further explain aspects of environmental or social behaviour that are unclear. Toolbox talks are recommended.			

9.2.3 Waste Management

This section deals with the issues relative to waste management during the construction phase.

Table 22: Waste Management

IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES
Waste Management: Litter management/general waste	• The Contractor shall provide a method statement with regard to waste management. • Refuse bins must be placed at strategic positions to ensure that litter does not accumulate within the construction site. • The Contractor shall supply waste collection bins and all solid waste collected shall be disposed of at registered/licensed landfill. • A certificate of disposal shall be obtained by the Contractor and kept on file, if relevant. • A housekeeping team should be appointed to regularly maintain the litter and rubble situation on the construction site. • If possible and feasible, all waste generated on site must be separated into glass, plastic, paper, metal and wood and recycled. An independent contractor can be appointed to conduct this recycling. • Where vegetation is cleared and is suitable, chipping and/or mulching can be considered.	Contractor The ECO shall monitor the neatness of the work sites as well as the Contractor campsite.	All waste managed according to approved Method Statement	Continuous

IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES
	• Littering by the employees of the Contractor shall not be allowed under any circumstances. • Skip waste containers should be maintained on site. These should be kept covered and arrangements made for them to be collected regularly. • Any putrescible waste must be stored in containers that can keep out scavengers such as baboons and birds to prevent the spread of litter. • Storm water must be managed in such a manner as to disperse runoff and to prevent the concentration of storm water flow. • Under no circumstances may solid waste be burnt on site.			
Waste Management: Hazardous waste	• All waste hazardous materials, if present, must be carefully and appropriately stored, and then disposed of off-site at a licensed landfill site, where practical. • Contaminants to be stored safely to avoid spillage. • Machinery must be properly maintained to keep oil leaks in check • All necessary precaution measures shall be taken to prevent soil or surface water pollution from hazardous materials used during construction and any spills shall immediately be cleaned up and all affected areas rehabilitated.	Contractor	All waste managed according to approved Method Statement	Continuous
Waste Management: Sanitation	• The Contractor shall install mobile chemical toilets on the site. • The construction of “Long Drop” toilets are forbidden. Rather, portable toilets are to be used. • Staff shall be sensitised to the fact that they should use these facilities at all times. No indiscriminate sanitary activities on site shall be allowed. Under no circumstances may open areas, neighbours fences or the surrounding bush be used as a toilet facility. • Ablution facilities shall be within proximity from workplaces and not closer than 100m from any natural water bodies or boreholes. There should be enough toilets available to accommodate the workforce (minimum	Contractor	Staff members aware of EMPr requirements and ablutions used and maintained accordingly	Continuous

IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES
	requirement 1: 15 workers). Male and females must be accommodated separately where possible. • Toilets shall be serviced regularly (with proof) • Potable water must be provided for all construction staff.			
Waste Management: Remedial Actions	• In the event of an accidental spill or leakage of hazardous substances, such incident(s) must be reported to all relevant authorities, including the Directorate: Pollution and Chemicals Management, in accordance with section 30(5) of the NEMA, 1998 pertaining to the control of incidents. • Depending on the nature and extent of the spill, contaminated soil must be either excavated or treated on-site. • Excavation of contaminated soil must involve careful removal of soil using appropriate tools/machinery to storage containers until treated or disposed of at a licensed hazardous landfill site. • The precise method of treatment for polluted soil must be identified by a suitable specialist. This could involve the application of soil absorbent materials as well as oil-digestive powders to the contaminated soil. • If a spill occurs on an impermeable surface such as cement or concrete, the surface spill must be contained using oil absorbent material. • If necessary, oil absorbent sheets or pads must be attached to leaky machinery or infrastructure. • Materials used for the remediation of petrochemical spills must be used according to product specifications and guidance for use. • Contaminated remediation materials must be carefully removed from the area of the spill so as to prevent further release of petrochemicals to the environment and stored in adequate containers until appropriate disposal.	Contractor	All waste managed according to approved Method Statement	Continuous

9.2.4 Agriculture

This section deals with the issues relative to agriculture during the construction phase.

Table 23: Agriculture

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
Site clearance and topsoil removal prior to the commencement of physical construction activities. The construction of stockpiles	• Ensure proper storm water management designs are in place; • If any erosion occurs, corrective actions (erosion berms) must be taken to minimize any further erosion from taking place; • If erosion has occurred, topsoil should be sourced and replaced and shaped to reduce the recurrence of erosion; • Only the designated access routes are to be used to reduce any unnecessary compaction; • Compacted areas are to be ripped to loosen the soil structure; • The topsoil should be stripped by means of an excavator bucket, and loaded onto dump trucks; • Topsoil stockpiles are to be kept to a maximum height of 4m; • Topsoil is to be stripped when the soil is dry, as to reduce compaction; • Bush clearing contractors will only clear bushes and trees larger than 1m the remaining vegetation will be stripped with the top 0.3 m of topsoil to conserve as much of the nutrient cycle, organic matter,	Applicant Contractor ECO	As prescribed by the Mitigation measures.	Prevent soil erosion and the loss of soil as a valuable resource	Construction/ Ongoing

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
	and seed bank as possible (only after alien vegetation has been removed); • The subsoil approximately 0.3 – 0.6 m thick will then be stripped and stockpiled separately; • The handling of the stripped topsoil will be minimized to ensure the soil's structure does not deteriorate significantly; • Compaction of the removed topsoil must be avoided by prohibiting traffic on stockpiles; • Topsoil stockpiles should only be used for the rehabilitation of the area; • The stockpiles will be vegetated in order to reduce the risk of erosion, prevent weed growth and to reinstitute the ecological processes within the soil. • Prevent any spills from occurring. Machines must be parked within hard park areas and must be checked daily for fluid leaks; • If a spill occurs, it is to be cleaned up immediately and reported to the appropriate authorities; • All vehicles are to be serviced in a correctly bunded area or at an off-site location; • Leaking vehicles will have drip trays place under them where the leak is occurring;				

9.2.5 Heritage

This section deals with the issues relative to heritage during the construction phase.

Table 24: Heritage

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
Impact to significant archaeology	• If any evidence of archaeological sites or remains (e.g., remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils, burials or other categories of heritage resources are found during the proposed development, work must cease in the vicinity of the find and SAHRA must be alerted immediately to determine an appropriate way forward.	ECO	N/A	Conservation of significant resources	Daily

9.2.6 Palaeontological

This section deals with the issues relative to paleontological during the construction phase.

Table 25: Palaeontological

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
Impact to significant palaeontology	If Palaeontological Heritage is uncovered during surface clearing and excavations ECO should be informed immediately. Fossil discoveries ought to be protected and the	ECO	N/A	Conservation of significant resources	Daily

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
	ECO/site manager must report to South African Heritage Resources Agency (SAHRA) so that Mitigation (recording and collection) can be carried out.				

9.2.7 Socio-Economic

This section deals with the issues relative to socio-economic during the construction phase.

Table 26: Socio-economic

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
Local employment opportunities during construction with accompanying skills development.	Implementation of a local employment policy and skills development programme.	The developer monitored by the Municipality.	Development and implementation of Standard Operating Procedures. Link into the Artisan Recognition of Prior Learning in the renewable energy storage value chain.	Local employment of contractor personnel.	Before contractor appointment and staff recruitment.
Local business and supplier development	Implementation of the Socio-Economic Development (SED) / Enterprise Development (ED) programmes required in terms of the REIPPP Programme.	The developer monitored by the Municipality	Link into the Internship programmes/opportunities in the renewable energy and storage sector by participating in Yes4Youth.	Creation of local suppliers	Before appointment of suppliers.

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
Influx of job seekers	Formulation of operating practices for the recruitment of contract workers to avoid an influx of unwanted persons seeking employment.	The developer monitored by the Municipality	Community information and training concerning the project and recruitment requirements	Prevention of an influx of job seekers coming to the site.	Before recruitment of contract workers.
Temporary increase in safety, security, and fire concerns.	Integrate the site security systems in the regional and farmer security processes, systems and networks.	The developer.	Coordinate the project's security and fire prevention systems with local security networks and SAPS.	Lower security and fire hazard risks.	Before contractor appointment and staff recruitment.
Traffic and nuisance impact for the temporary increase in traffic, noise and dust.	Traffic management to the site and use of dust management practices during construction.	As per mitigation actions provided in the specialist report.	As per mitigation actions provided in the specialist report.	As per mitigation actions provided in the specialist report.	As per mitigation actions provided in the specialist report.

9.2.8 Transport

This section deals with the issues relative to transportation during the construction phase.

Table 27: Transport

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/FREQUENCY
Increase in road traffic	• Group transportation of staff	Contractor	Planning	Reduce the magnitude of additional road traffic	Daily

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/FREQUENCY
	• Stagger material, plant and equipment deliveries	Contractor	Programming of works	Reduce the magnitude of additional road traffic	Weekly
	• Schedule deliveries for off-peak times	Contractor	Programming of works	Reduce the magnitude of additional road traffic	Weekly
	• Adequate traffic law enforcement	Contractor	Traffic management plan	Safely manage additional road traffic	Daily
Increase in traffic incidents with pedestrians and livestock	• Reduce and control speed of vehicles	Contractor	Traffic management plan	Avoid incidents with pedestrians and livestock	Daily
	• Safe accommodation of pedestrians	Contractor	Traffic management plan	Avoid incidents with pedestrians	Daily
	• Implement pedestrian safety initiatives	Contractor	Social facilitation	Avoid incidents with pedestrians	Monthly
	• Regularly maintain farm fences & access cattle grids	Contractor	Inspections and communications	Avoid incidents with livestock	Monthly
Increase in road degeneration	• Regularly conduct conditional assessments on gravel roads	Contractor	Visual inspections	Identify deterioration of local roads timeously	Monthly
	• Implement a road maintenance program under the auspices of the respective transport department	Contractor, Local authority	Road maintenance	Reduce/address deterioration of local roads	Bi-annually
Addition of Abnormal Loads	• Stagger abnormal load deliveries	Contractor	Programming of works	Reduce the disturbance of road	Construction

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/FREQUENCY
				users associated with the transporting of abnormal loads	
	• Schedule abnormal load deliveries for off-peak time	Contractor	Programming of works	Reduce the disturbance of road users associated with the transporting of abnormal loads	Construction
	• Ensure compliance with permits	Contractor	Inspections	Safely manage abnormal loads	Construction
	• Adequate traffic law enforcement	Contractor	Traffic management plan	Safely manage abnormal loads	Construction

9.2.9 Aquatic Biodiversity

This section deals with the issues relative to aquatic biodiversity during the construction phase.

Table 28: Aquatic Biodiversity

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
Impacts to hydrological function at a landscape level	• During the construction phase, best practice mitigation measures should be implemented.	ECO	Construction Monitoring and Preventative Measures	Best practice, limiting harm as per National Environmental Management Act No. 107 of 1998	Construction

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
	• Excavated materials should not be contaminated and it should be ensured that the minimum surface area is taken up. • Where possible Demarcate the watercourse areas and buffer zones to limit disturbance, clearly mark these areas as no-go areas. • Where development activities are located upslope from wetlands, effective stormwater management should be a priority during both construction and operational phase. This should be monitored as part of the EMP. • Do not permit vehicular or pedestrian access into natural areas or into seasonally wet areas during and immediately after rainy periods, until such a time that the soil has dried out. • Rehabilitation plans must be submitted and approved for rehabilitation of damage during the construction phase and that plan must be implemented immediately upon completion of construction. • Effective control of stormwater from access roads should be undertaken. • Effective culverts should be incorporated into the design of access roads. • Where development activities are located upslope from wetlands, effective stormwater management should be a			Ensure EMPr is adhered to	

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
	priority during both construction and operational phase. This should be monitored as part of the EMP.				
Sedimentation	• Sediment traps should be installed. • Retain vegetation and soil in position for as long as possible, removing it immediately ahead of construction / earthworks in that area. • During the construction phase measures must be put in place to control the flow of excess water so that it does not impact on the adjacent surface vegetation. • Sediment control should be effective and not allow any release of sediment pollution downstream. This should be audited on a monthly basis to demonstrate compliance with upstream conditions. • Any excavated soil/ should not be stored close to watercourses. Mixture of the lower and upper layers of the excavated soil should be kept to a minimum, so as for later usage as backfill material. • Protect all areas susceptible to erosion and ensure that there is no undue soil erosion resultant from activities within and adjacent to the construction camp and work areas. • Monitoring should be done to ensure that sediment pollution is timeously addressed	ECO	Construction Monitoring and Preventative Measures	Best practice, limiting harm as per National Environmental Management Act No. 107 of 1998	Construction

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
Introduction and spread of alien vegetation.	• Long-term monitoring for the establishment of alien invasive species within the areas affected by the construction and maintenance and take immediate corrective action where invasive species are observed to establish, as specified in the Alien Vegetation Management Pan • Retain vegetation and soil in position for as long as possible, removing it immediately ahead of construction / earthworks in that area and returning it where possible afterwards.	ECO	Construction Monitoring and Preventative Measures	Best practice, limiting harm as per National Environmental Management Act No. 107 of 1998	Construction
Loss and disturbance of watercourse habitat and fringe vegetation.	• The development footprint should remain outside the delineated watercourses areas and buffer zones. Where this is unavoidable a Watercourse offset plan and/or a Water use license should be developed and authorised. This should be discussed with the relevant authorities, and if deemed necessary an offset plan should be developed and approved. • Where possible Demarcate the watercourse areas and buffer zones to limit disturbance, clearly mark these areas as no-go areas. • Implement an Alien Plant Control Plan • Conduct thorough vegetation surveys and assessments before construction to identify sensitive habitats, watercourses, and fringe vegetation. Use this information	ECO	Construction Monitoring and Preventative Measures	Construction Monitoring and Preventative Measures	Construction

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
	to inform design decisions and avoid or minimise impacts to these areas. • Carefully plan the solar plant layout to avoid or minimize the disturbance of watercourses and sensitive fringe vegetation. • Monitor the establishment of alien invasive species within the areas affected by the construction and take immediate corrective action where invasive species are observed to establish. • Develop a restoration and replanting plan to mitigate the loss of habitat and fringe vegetation. This may involve revegetation with native plant species, especially in areas where vegetation has been removed or disturbed during construction.				
Changes in water quality	• Implementation of appropriate stormwater management around the excavation to prevent the ingress of run-off into the excavation and to prevent contaminated runoff into the watercourse. • Incorporation of phytoremediation into the storm water attenuation systems to facilitate nutrient reduction, sediment regime control and manage toxicants releases. • Provision of adequate sanitation facilities located outside of the watercourse area or its associated buffer zone	ECO	Construction Monitoring and Preventative Measures	Best practice, limiting harm as per National Environmental Management Act No. 107 of 1998	Construction

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
	• Implement stormwater management practices to control and treat runoff from the solar plant site. This can involve the use of retention ponds, biofiltration systems, or constructed wetlands to capture and treat stormwater runoff before it enters water bodies. • Establish a robust water quality monitoring program to regularly assess the condition of water bodies near the solar plant. This includes monitoring key parameters such as pH, turbidity, dissolved oxygen, and levels of contaminants. Promptly report any deviations or exceedances from established water quality standards. • Control of waste discharges and do not allow dirty water from operational activities to enter the watercourse. • Develop norms and standards for the treatment of spills such as oil or hydraulic fluid. Ensure that the required equipment is available on hand to contain any spills. • Appoint a reliable contractor for the removal of refuse during the construction phase.				
Loss of aquatic biota	• Ensure that no unnecessary vegetation is removed during the construction phase. • Avoid unnecessary aquatic ecosystem crossing - limit work within the stream, river	Construction Monitoring and Preventative Measures	Construction Monitoring and Preventative Measures	Best practice, limiting harm as per National Environmental Management Act No. 107 of 1998	Construction

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
	or wetland. The use of single access points for crossings. • Implement weed control in aquatic ecosystem and buffer zones. • Monitor the establishment of alien invasive species within the areas affected by the construction and maintenance of the proposed infrastructure and take immediate corrective action where invasive species are observed to establish. • Identify and protect important habitats for aquatic biota, such as wetlands, rivers, and streams, within and near the solar plant site. Implement habitat restoration projects to enhance and create suitable habitats for aquatic organisms. • Implement measures to maintain and improve water quality, such as implementing erosion control practices, managing stormwater runoff, and reducing the discharge of pollutants into water bodies. Regular monitoring of water quality parameters should be conducted to ensure compliance with standards and prompt identification of any issues				

9.2.10 Avifauna

This section deals with the issues relative to avifauna during the construction phase.

Table 29: Avifauna

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/FREQUENCY
Disturbance of bird roosts	• As with other impacts, this impact can be mitigated by timing of any panel construction to not commence in November, December and January in order to avoid breeding periods of species within the sensitive drainage lines, wetlands and the general region.	Client Appointed ECO.	• Drive Transects (species lists) – all species seen to be recorded along set transects to be driven during dawn till pre 10 am; and • Walked Transects (species lists) – all species heard and seen to be recorded along set transects to be walked at dawn chorus. • All variables acquired should be statistically and graphically compared to the available data	• Loss/ decrease in any SCC parameter, unnatural decline (cannot be explained by stochastic weather changes) in species densities and/or richness. Similarly, positive changes (e,g, unusual presence in high densities of nomadic species such as Bustards or establishment of SCC breeding populations (not yet sighted), Large SCC Raptors and Secretary Bird) in species densities and/or richness that indicate disturbance. Rapid surveys of greater surrounding	Twice weekly during construction.

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/FREQUENCY
			and the original targeted baseline data. Photographs should be taken of as many SCC observed in the field. • Quarterly reporting presenting data analysis results and mapping indicating locations of change. Specific reporting on negative change detection not directly attributable to Project activities (Solar Facility Operation) and their cause. All reporting to be accompanied by GIS shapefiles and any original photographs.	area should be conducted to attempt to determine cause of change detected.	

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/FREQUENCY
Disturbance due to noise such as, machinery movements	As with "Disturbance of bird roosts"	As with "Disturbance of bird roosts"	As with "Disturbance of bird roosts"	As with "Disturbance of bird roosts"	As with "Disturbance of bird roosts"

9.2.11 Terrestrial Biodiversity

This section deals with the issues relative to biodiversity during the construction phase.

Table 30: Terrestrial Biodiversity

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES
Alien Invasive Species Invasion	• Alien invasive species (AIS) and weeds must be removed from the site as per CARA/NEMBA requirements. • A suitable AIS and weed management strategy to be implemented during construction and operation phases. • After clearing and construction is completed, an appropriate cover may be required, should natural re-establishment of grasses not take place in a timely manner along road verges. This will also minimise dust.	Authorisation Holder / Project Manager / ECO		To minimise regeneration of AIS and weeds	Quarterly during the construction phase. Annually during the operational phase. Once-off during the decommissioning phase.

9.2.12 Visual

This section deals with the issues relative to visual during the construction phase.

Table 31: Visual

IMPACT/ ASPECT	MITIGATION/MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
Topsoil loss can reduce the viability of rehabilitation measures and needs to be carefully managed if available.	• Topsoil excavated from the site should be stockpiled and utilised for rehabilitation of the site after construction.	Project management and EPC	As defined by the rehabilitation specialist.	Topsoil is utilized and no sterilization of topsoil takes place.	As required.
Un-necessary roads have the potential to create a visual disturbance long after the usage as past.	• Limit road access to an efficient minimum by coordinated planning between the project management and the ECO.	Project management and EPC	Temporary roads should be well marked and should only cross drainage lines on areas identified as permanent road features where erosion and soil loss management can be contained. Non-compliance with road signage and utilisation of no authorised roads should become a finable offence.	The surrounding landscape remains rural and agricultural in landscape and land use.	As required.
Windblown dust and dust from moving vehicles have the potential to become a significant nuisance factor to local farms around the site and along the access road.	• Set up a clear management plan with clear accountability structures with set thresholds for triggering of mitigations. • Set up a liaison committee to engage with local farmsteads	Project management and EPC (as the issue arises).	Should excessive dust be generated from the movement of vehicles on the roads such that the dust becomes visible to the immediate surrounds, dust-	Dust generated on site as well as on the access road to the site, is well managed and does not become a nuisance factor	On-going

IMPACT/ ASPECT	MITIGATION/MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
	located within 500m of an access road, with monthly communication with the farm owners on the effectiveness of the dust management procedures.		retardant measures should be implemented under authorisation of the EPC.	for the workers or the surrounding farmsteads.	
Buildings painted bright colours can increase the visual presence of the structures in a rural landscape, creating higher levels of visual contrast and attracting the attention of the casual observer. (BESS excluded)	• The buildings should be painted a grey, brown colour (or other colour in keeping with the surrounding landscape) to assist in reducing colour contrast. • Sheet metal structures should make use of mid-grey colour, and preferable have a rough texture material. • As BESS structure often require a white paint of containers to reduce heat risk to the batteries, the BESS is excluded from the colour mitigation. Risk to landscape is low due to limited visibility and low receptors exposure.	Project management and EPC	At the commencement of construction, purchase order criteria for ordering paints and sheet metals need to be clearly defined.	Colour contrast generated from the buildings as seen from the roads is low and does not attract the attention of the casual observer.	Commencement of construction.
Light spillage from security lighting of structures can significantly increase the visual impact of a project in a	• Light spillage mitigation from security lighting should be implemented and monitored by the ECO during construction to	Project management and EPC	At the commencement of construction, purchase order criteria for ordering of	Lights contrast generated from the buildings as seen from the roads is low and does not attract	Commencement of construction.

IMPACT/ ASPECT	MITIGATION/MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
rural landscape in a dark-sky context.	ensure that light spillage does not create a glowing effect. • No overhead/ flood lighting of structures or areas. • No up lighting to be used.		security lighting need to be clearly defined.	the attention of the casual observer.	
Litter has the potential to degrade landscape character and can be contained by fencing around the construction camp/ laydown.	• Littering should be a finable offence. • Fencing around the laydown should be diamond shaped to catch windblown litter. The fences should be routinely checked for the collection of litter caught on the fence.	Project management and EPC	Littering rules need to be clearly defined and workers effectively informed of the consequences of littering.	Solid waste litter is effectively controlled and does not become a landscape degradation risk.	Checked bi-monthly
Soil erosion can result in visual scarring on prominent areas.	• In areas where construction has taken place on steeper slopes, soil erosion measures need to be implemented.	Project management and EPC (checked monthly)	Clear methodology for rehabilitation and restoration is provided by the rehabilitation specialist. As soon as construction has concluded on the area at hand, rehabilitation processes need to commence.	Soil erosion is limited and effectively managed such that visual scarring does not take place.	Commencement of construction. On-going
Cut and Fill areas can generate visual scarring in the landscape beyond the locality.	• Cut & Fill areas should be limited as much as possible, with specific detail placed on prevention of soil erosion.	Project management and EPC with inputs from rehabilitation specialist.	Clear methodology for rehabilitation and restoration is provided by the rehabilitation specialist. As soon as construction	Cut/ fill scaring is limited and effectively managed and does not dominate the attention of the casual observer.	Commencement of construction. On-going

IMPACT/ ASPECT	MITIGATION/MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
	• Slopes should not exceed 1 in 6m gradients and need to be rehabilitated to natural vegetation directly post construction.		has concluded on the area at hand, rehabilitation processes need to commence.		

9.2.13 Glint and Glare

This section deals with the issues relative to Glint and Glare during the construction phase.

Table 32: Glint and Glare

Impact/ Aspect	Mitigation/Management Actions	*Responsibility*	*Methodology*	Mitigation/Management Objectives and Outcomes	*Frequency*
Due to low glare intensity observed during the analysis of the site, no negative impacts were identified and therefore no mitigation measures are required for the proposed solar PV modules. Using smooth glass solar PV modules without protective coatings will be suitable and not cause any harmful visual impact on surroundings.					

9.3 Operation Phase

9.3.1 Construction Site Decommissioning

This section deals with the issues relative to construction site decommissioning during the operation phase.

Table 33: Construction Site Decommissioning

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES
Construction Site Decommissioning: Removal of equipment	• All structures comprising the construction camp are to be removed from site. • The area that previously housed the construction camp is to be checked for spills of substances such as oil, paint, etc., and these shall be cleaned up. • All hardened surfaces within the construction camp area should be ripped, all imported materials removed, and the area shall be top soiled and regressed using the guidelines set out in the re-vegetation that forms part of this document.	Holder of EA/Contractor	Compliance to all legislative requirements. Ensure the EMPr is adhered to.	Following construction
Construction Site Decommissioning: Temporary services	• The Contractor must arrange the cancellation of all temporary services. • Temporary roads must be closed and access across these, blocked. • All areas where temporary services were installed are to be rehabilitated to the satisfaction of the ECO.	Holder of EA/Contractor	Compliance to all legislative requirements. Ensure the EMPr is adhered to.	Following construction
Construction Site Decommissioning: Associated infrastructure	• Surfaces are to be checked for waste products from activities such as concreting or asphalting and cleared in a manner approved by the Engineer. • All surfaces hardened due to construction activities are to be ripped and imported material thereon removed.	Holder of EA/Contractor	All waste managed according to approved Method Statement	Following construction

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES
	• All rubble is to be removed from the site to an approved disposal site as approved by the Engineer. Burying of rubble on site is prohibited. • The site is to be cleared of all litter. • The Contractor is to check that all watercourses are free from building rubble, spoil materials and waste materials. • Fences, barriers and demarcations associated with the construction phase are to be removed from the site unless stipulated otherwise by the Engineer. • All residual stockpiles must be removed to spoil or spread on site as directed by the Engineer. • All leftover building materials must be returned to the depot or removed from the site. • The Contractor must repair any damage that the construction works has caused to neighbouring properties, specifically, but not limited to, damage caused by poor storm water management.			
Construction Site Decommissioning: Rehabilitation plan	• Rehabilitate and re-vegetate cleared areas with indigenous plant species.	Holder of EA/Contractor	Alien Plant Management Plan Plant Rehabilitation implemented	Following construction

9.3.2 Operation and Maintenance

This section deals with the issues relative to operation and maintenance during the operation phase.

Table 34: Operation and Maintenance

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES
Operation and Maintenance: Maintenance	• All applicable standards, legislation, policies and procedures must be adhered to during operation. • Regular ground inspection of the plants must take place to monitor their status. • Compile and adhere to a procedure for the safe handling of battery cells. • Lithium-ion batteries must have battery management systems (containment, automatic alarms, and shut-off systems) to monitor and protect cells from overcharging or damaging conditions, such as temperature extremes. • Compile an Emergency Response Plan for implementation in the event of a spill or leakage. • Record and report all significant fuel, oil, hydraulic fluid, or electrolyte spills or leaks so that appropriate clean-up measures can be implemented. A copy of these records must be made available to authorities on request throughout the project lifecycle. • Frequent and appropriate disposal of both general and hazardous waste must be undertaken to prevent pollution of soil and groundwater. • Install leak detection monitoring systems where possible. • On-site battery maintenance should only be undertaken on impermeable surfaces with secondary containment measures. Any resulting hazardous substances must be disposed of appropriately.	Holder of the EA	Ensure the conditions of the EA are adhered to. Compliance to all legislative requirements	During operation

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES
	• Provide for suitable emergency and safety signage on site, and demarcation of any areas which may pose a safety risk (including hazardous substances). Emergency numbers for the local police, fire department and Eskom must be placed in a prominent clearly visible area on-site			
Operation and Maintenance: Public awareness	• The emergency preparedness plan must be ready for implementation at all times should an emergency situation arise.	Holder of the EA	Adhere to Emergency Evacuation Plan	During operation

9.3.3 Waste Management

This section deals with the issues relative to waste management during the operation phase.

Table 35: Waste Management

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	IMPACT MANAGEMENT OUTCOMES	TIME FRAME
Waste Management: Recycling and litter management	• The site should be kept clear of litter at all times. • Solid waste separation and recycling should take place for the duration of the operational phase for the development at the administration block. • Where vegetation is cleared and is suitable, chipping and/or mulching can be considered. • Any putrescible waste must be stored in containers that can keep out scavengers such as baboons and birds to prevent the spread of litter. • All waste must be removed promptly to ensure that it does not attract vermin or produce odours.	Holder of EA	All waste managed according to approved Method Statement Compliance to all legislative requirements.	Continuous

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	IMPACT MANAGEMENT OUTCOMES	TIME FRAME
	• Solid waste should be collected on a regular basis • Waste needs to be collected and disposed of at a registered municipal site during and after construction, and written agreement should be provided to the Northern Cape region Department of Water and Sanitation.			

9.3.4 Agricultural

This section deals with the issues relative to agricultural during the operation phase.

Table 36: Agricultural

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
Operation and maintenance of the topsoil stockpiles. Rehabilitation of the Project area will be undertaken, which includes the ripping of the compacted soil surfaces, spreading of topsoil and establishment of vegetation.	• Ensure proper storm water management designs are in place; • If erosion occurs, corrective actions (erosion berms) must be taken to minimize any further erosion from taking place; • If erosion has occurred, topsoil should be sourced and replaced and shaped to reduce the recurrence of erosion; • Only the designated access routes are to be used to reduce any unnecessary compaction;	Applicant • Contractor ECO	As prescribed by the Mitigation measures.	Prevent soil erosion and the loss of soil as a valuable resource	Ongoing

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
	• Compacted areas are to be ripped to loosen the soil structure and vegetation cover re-instated; • Implement land rehabilitation measures; • Follow rehabilitation guidelines; • The topsoil should be moved by means of an excavator bucket, and loaded onto dump trucks; • Topsoil is to be moved when the soil is dry, as to reduce compaction; • Topsoil to be replaced for rehabilitation purposes; • The handling of the stripped topsoil will be minimized to ensure the soil's structure does not deteriorate; and • Topsoil stockpiles should only be used for the rehabilitation of the area; • Prevent any spills from occurring. Machines must be parked within hard park areas and must be checked daily for fluid leaks; • If a spill occurs, it is to be cleaned up immediately and reported to the appropriate authorities; • All vehicles are to be serviced in a correctly bunded area or at an off-site location; • Leaking vehicles will have drip trays place under them where the leak is occurring;				

9.3.5 Socio-economic

This section deals with the issues relative to socio-economic during the operation phase.

Table 37: Socio-economic

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
Creation of direct employment coupled with skills development.	• Implementation of a local employment policy and skills development programme.	The developer monitored by the Municipality.	Development and implementation of Standard Operating Procedures. Link into the Artisan Recognition of Prior Learning in the renewable energy storage value chain.	Local employment of contractor personnel. Before contractor	Before contractor appointment and staff recruitment.
Visual and sense of place impacts and related impacts on tourism.	• As specified in the Landscaping to visually screen the project	As specified in the Landscaping to visually screen the project	As specified in the Landscaping to visually screen the project	As specified in the Landscaping to visually screen the project	As specified in the Landscaping to visually screen the project
Removal of productive agricultural land.	• As specified in the specialist report	As specified in the specialist report	As specified in the specialist report	As specified in the specialist report	As specified in the specialist report

9.3.6 Transport

This section deals with the issues relative to transportation during the operation phase.

Table 38: Transport

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/FREQUENCY
Increase in road traffic	• Group transportation of staff	Operator	Planning	Reduce the magnitude of additional road traffic	When required
Increase in traffic incidents with pedestrians and livestock	• Safe accommodation of pedestrians	Operator	Monitoring	Avoid incidents with pedestrians	Weekly
	• Reduce vehicle speed	Operator	Monitoring	Avoid incidents with pedestrians and livestock	Daily
	• Regularly maintain farm fences & access cattle grids	Operator	Inspections and Reporting	Avoid incidents with livestock	Monthly
Addition of Abnormal Loads	• Schedule abnormal load deliveries for off-peak time	Operator	Programming of maintenance	Reduce the disturbance of road users associated with the transporting of abnormal loads	When required
	• Ensure compliance with permits	Contractor	Inspections	Safely manage abnormal loads	When required
	• Adequate traffic law enforcement	Contractor	Traffic management plan	Safely manage abnormal loads	When required

9.3.7 Aquatic Biodiversity

This section deals with the issues relative to aquatic biodiversity during the operation phase.

Table 39: Aquatic Biodiversity

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
Impacts to hydrological function at a landscape level	• Do not permit vehicular or pedestrian access into natural areas or into seasonally wet areas during and immediately after rainy periods, until such a time that the soil has dried out. • Rehabilitation plans must be submitted and approved for rehabilitation of damage during the construction phase and that plan must be implemented immediately upon completion of construction. • Effective control of stormwater from access roads should be undertaken. • Effective culverts should be incorporated into the design of access roads. • Where development activities are located upslope from wetlands, effective stormwater management should be a priority during both construction and operational phase. This should be monitored as part of the EMP.	ECO	Construction Monitoring and Preventative Measures	Ensure EMPr is adhered to	Operation
Sedimentation	• Sediment control should be effective and not allow any release of sediment pollution downstream. This should be audited on a	ECO	Monitoring	Ensure EMPr is adhered to	Operation

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
	monthly basis to demonstrate compliance with upstream conditions. • Monitoring should be done to ensure that sediment pollution is timeously addressed				
Introduction and spread of alien vegetation.	• Long-term monitoring for the establishment of alien invasive species within the areas affected by the construction and maintenance and take immediate corrective action where invasive species are observed to establish, as specified in the Alien Vegetation Management Pan • Undertake an Alien Plant Control Plan which specifies actions and measurable targets • Rehabilitate or revegetate disturbed areas • Acquire the necessary equipment for removal and control • Planned sequence of areas to be cleared of invasive plants • A register of the methods used, dates undertaken, as well as herbicides and dosage used must be kept and available on site. The register must also include incidents of poisoning or spillage □ Ensure that contractors can identify the relevant plants and are aware of the removal procedures • Construction equipment must be cleaned prior to site access. This will prevent alien	ECO	Monitoring	Ensure EMPr is adhered to	Operation

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
	invasive seed from other sites to spread into disturbed soils • Manual removal methods are preferred to chemical control • Rehabilitate or revegetate disturbed areas.				
Loss and disturbance of watercourse habitat and fringe vegetation.	• Monitor rehabilitation and the occurrence of erosion twice during the rainy season for at least two years and take immediate corrective action where needed. • Implement sediment and erosion control measures to prevent sediment runoff from construction activities into watercourses. This can include sediment barriers, sediment ponds, and erosion control blankets to protect the water quality and vegetation along the watercourses • Establish a monitoring program to assess the effectiveness of mitigation measures and monitor the condition of watercourses and fringe vegetation during and after construction	ECO	Monitoring	Ensure EMPr is adhered to	Operation
Changes in water quality	• Independent water quality analyses should be undertaken annually, or as specified by an aquatic specialist, to demonstrate and audit compliance of effective pollution control measures • A detailed rehabilitation plan should be drawn up with the input from a water quality, soil contamination assessment and ecologist should any spills occur.	ECO	Monitoring	Ensure EMPr is adhered to	Operation

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
	• It should be ensured that regular maintenance takes place to prevent failure of any infrastructure associated with the proposed decommissioning • Incorporation of phytoremediation into the storm water attenuation systems to facilitate nutrient reduction, sediment regime control and manage toxicants releases. • Provide training to personnel involved in the solar plant's operation and maintenance on best practices for water quality protection. Promote awareness and understanding of the potential impacts of the solar plant on water quality and the importance of adhering to mitigation measures • Ensure that no decommissioning activities impact on the watercourse or buffer area. This includes edge effects.				
Loss of aquatic biota	• Implement weed control in aquatic ecosystem and buffer zones. • Monitor the establishment of alien invasive species within the areas affected by the construction and maintenance of the proposed infrastructure and take immediate corrective action where invasive species are observed to establish. • Identify and protect important habitats for aquatic biota, such as wetlands, rivers, and	ECO	Monitoring	Ensure EMPr is adhered to	Operation

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
	streams, within and near the solar plant site. Implement habitat restoration projects to enhance and create suitable habitats for aquatic organisms. • Implement measures to maintain and improve water quality, such as implementing erosion control practices, managing stormwater runoff, and reducing the discharge of pollutants into water bodies. Regular monitoring of water quality parameters should be conducted to ensure compliance with standards and prompt identification of any issues				

9.3.8 Avifauna

This section deals with the issues relative to avifauna during the operation phase.

Table 40: Avifauna

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/FREQUENCY
Bird mortalities	• Impacts due to bird mortalities during the operational phase are practically unavoidable for any large facility, but with the appropriate mitigation measures these impacts can be minimised.	Company Appointed ECO, trained by SACNASP registered Zoologist.	• For panel location sites: weekly inspection on foot of cleared areas for birds	Collision frequency and intensity (# kills per species per unit time) will need to be assessed per species by a specialist.	Weekly for panels between November and March.

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/FREQUENCY
	• It is likely that most of the avifaunal populations will be largely displaced from the majority of the project infrastructure, although significant risks are associated with the likelihood of project vehicles flushing birds into fencing infrastructure as well as collisions of large bodied species with powerlines. Although the current overall bird activity qualifies the proposed solar development boundary as a high-density area, there are certain times of the year (and day) when it appears that large flocks of birds (such as cranes, bustards and large birds of prey) are far more prevalent. • All powerline infrastructure must be fitted with approved bird diverters in order to provide visibility for large-bodied birds. In all areas where service road intersects with semi natural or natural habitat, all fences must be set back at least (strictly) 75 metres from the edge of every service road in order to allow for vulnerable species such as bustards, raptors and korhaans to obtain adequate height after being flushed by vehicle traffic. • An Alternative mitigation measure and where a 75-metre buffer is not possible, new fences must be set back no more than 5 metres (directly adjacent) from the edge of service roads. Through the essential elimination of habitat, this will limit any chance of vulnerable		killed during the operation process. • Location and species must be recorded (a georeferenced photograph as evidence is also required). • Monthly reporting presenting data analysis results and mapping indicating locations of change. Specific reporting on negative change detection not directly attributable to Project activities (Solar Facility Operation) and their cause. All reporting to be accompanied by GIS shapefiles	However, any non-specific collision concentrations (> 10 kills per month clustering in a stretch of powerline) must initiate investigation and corrective measures (including retrofitting of mitigation measures).	

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/FREQUENCY
	species foraging on verge side vegetation and causing subsequent fence collisions.		and any original photographs.		
Disruption of bird migratory pathways The attraction of some novel bird species due to the development of a solar farm with associated infrastructure such as lake effect, perches, nest and shade opportunities. Disturbance due to noise such as, machinery movements and maintenance operations.	• Migratory pathways of birds cannot be changed, and the resulting impacts are unavoidable. However, severity of the impacts can be reduced with appropriate mitigation measures. Some significant discernible migratory flight pathways were able to be established which could be explained by large areas of generic habitats punctuated by some distinguishing geographic features in the landscape, such as large ridges, large impoundments, wetlands and drainage lines. The linear drainage line habitats must be buffered in accordance with the EIA sensitivity mapping. • Essentially, all habitat attractants should be eliminated so that avifaunal populations will not embed themselves within the infrastructure over time. This includes bird diverters; perch deterrents and the application of non-polarising white tape can be used around and/or across panels to minimise reflection which can attract aquatic birds and insects (food) as panels mimic reflective surfaces of waterbodies.	Company Appointed ECO, trained by a SACNASP registered Zoologist.	• For panel location sites: • Monthly inspection using Drive and Walking Transects. • CWAC counts	Species inventories and passage rate data collection.	Monthly SCC and species inventories during November, December, January and February
Chemical pollution	• The application of strict chemical control protocols as per the EMPr.	Company appointed ECO.	For panel location sites: weekly inspection on foot	Spill Records • Yearly chemical analysis results	Weekly spill detection for panels

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/FREQUENCY
			• Yearly soil analysis sent to accredited lab	matched to prescribed thresholds	

9.3.9 Terrestrial Biodiversity

This section deals with the issues relative to biodiversity during the operation phase.

Table 41: Terrestrial Biodiversity

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES
Alien Invasive Species Invasion	• Alien invasive species (AIS) and weeds must be removed from the site as per CARA/NEMBA requirements. • A suitable AIS and weed management strategy to be implemented during construction and operation phases. • After clearing and construction is completed, an appropriate cover may be required, should natural re-establishment of grasses not take place in a timely manner along road verges. This will also minimise dust.	Authorisation Holder / Project Manager / ECO	N/A	To minimise regeneration of AIS and weeds	Quarterly during the construction phase. Annually during the operational phase. Once-off during the decommissioning phase.

9.3.10 Visual

This section deals with the issues relative to visual during the operation phase.

Table 42: Visual

IMPACT/ ASPECT	MITIGATION/MANAGEMENT ACTIONS	RESPONSIBILITY	METHODOLOGY	MITIGATION/MANAGEMENT OBJECTIVES AND OUTCOMES	FREQUENCY
Compaction of larger areas can result in soil sterilisation and landscape degradation.	• Post construction, the laydown areas and other construction areas no longer needed for operational management, should be ripped (0.5m depth) to restore compacted topsoil, and then rehabilitated to natural vegetation under the supervision of the rehabilitation specialist.	Project management and EPC with inputs from rehabilitation specialist.	As defined by the rehabilitation specialist.	Soil sterilization does not take place and large degraded areas do not occur, with overall landscape integrity maintained.	On completion of construction phase. On-going
Soil erosion can result in visual scarring on prominent areas.	• In areas where construction has taken place on steeper slopes, soil erosion measures need to be implemented.	Project management and EPC	Clear methodology for rehabilitation and restoration is provided by the rehabilitation specialist. As soon as construction has concluded on the area at hand, rehabilitation processes need to commence.	Soil erosion is limited and effectively managed such that visual scarring does not take place.	Bi-annual
Light spillage from security	• Light spillage measures designed during pre-	Project management and EPC.	A review of the security lights at night	Lights contrast generated from the buildings as seen from the	At commencement of Operation Phase.

IMPACT/ ASPECT	MITIGATION/MANAGEMENT ACTIONS	RESPONSIBILITY	METHODOLOGY	MITIGATION/MANAGEMENT OBJECTIVES AND OUTCOMES	FREQUENCY
lighting of structures can significantly increase the visual impact of a project in a rural landscape in a dark-sky context.	construction phase should be implemented and monitored by the ECO during construction to ensure that light spillage does not create a glowing effect.		is undertaken by the EPC to check that undue light spillage is not taking place without loss of security.	roads is low and does not attract the attention of the casual observer.	
Windblown dust and dust from moving vehicles have the potential to become a significant nuisance factor to local farms around the site and along the access road.	• Should excessive dust be generated from the movement of vehicles on the roads such that the dust becomes visible to the immediate surrounds, dust-retardant measures should be implemented under authorization of the ECO.	Project management and EPC (as the need arises).	Set up a clear management plan with clear accountability structures with set thresholds for triggering of mitigations.	Dust generated on site as well as on the access road to the site, is well managed and does not become a nuisance factor for the workers or the surrounding farmsteads.	On-going.

9.4 Decommissioning Phase

9.4.1 On-going Stakeholder involvement

This is the process that is recommended when the proposed PV facility are decommissioned.

Table 43: On-going Stakeholder involvement

IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	IMPACT MANAGEMENT ACTIONS	TIME FRAME
Ongoing Stakeholder Involvement	• Community to be notified, as culturally appropriate, timeously of the planned decommissioning, e.g.: – Proposed decommissioning start date; and – Process to be followed. • Recommend that a meeting with community leader(s) be held before decommissioning commence to inform them: – What activities will take place during the decommissioning phase. – How these activities will impact upon the communities and/or their properties. – Regarding the timeframes of scheduled activities • Regular interaction between the client and community leader(s) during the decommissioning phase. • A reporting office/ channel to be established should community members experience problems with contractors/ sub-contractors during the decommissioning phase. • A register to be kept of problems reported by community members and the steps taken to address / resolve it.	Holder of the EA	Clear communication channels maintained	During decommissioning

9.4.2 Waste Management

This section deals with the issues relative to waste management during the decommissioning phase.

Table 44: Waste Management

IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	IMPACT MANAGEMENT ACTIONS	TIME FRAME
Waste Management	• All decommissioned equipment must be removed from site and disposed of at a registered land fill. Records of disposal must be kept. • Any putrescible waste must be stored in containers that can keep out scavengers such as baboons and birds to prevent the spread of litter. • PV panels must be returned to the manufacturer or relevant recycling agent to be recycled.	Holder of the EA	All waste managed according to approved Method Statement	During decommissioning

9.4.3 Aquatic Biodiversity

This section deals with the issues relative to aquatic biodiversity during the decommissioning phase.

Table 45: Aquatic biodiversity

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
Impacts to hydrological function at a landscape level	• Effective control of stormwater from access roads should be undertaken. • Implement Best Practice with regards to concrete mixing on site and control of waste and pollution	Developer and Contractor ECO	Monitoring	Best practice, limiting harm as per National Environmental Management Act No. 107 of 1998	Decommissioning

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
	• Where structures are removed from nearby watercourses care should be taken not to disturb a larger footprint than needed. • Do not increase hardened surfaces and compaction of the soils after the removal of the solar panels and related infrastructure. • Rehabilitation of exposed soil surfaces should commence as soon as practical after completion of removal of removal of the solar panels and related infrastructure. • Culverts must remain in place and must not be removed if the given road is not removed during the decommissioning phase. • Vehicle movement should be restricted to designated decommissioning areas to prevent the increase in hardened surfaces and subsequent increase in runoff.				
Sedimentation	• Retain vegetation and soil in position for as long as possible, removing it immediately ahead of earthworks in that area. • Sediment traps should be installed • Sediment control should be effective and not allow any release of sediment pollution downstream. This should be audited on a monthly basis to demonstrate compliance with upstream conditions. • Any excavated soil/ should not be stored close to watercourses. Mixture of the lower and upper layers of the excavated soil	ECO	Monitoring and Preventative Measures and Rehabilitation	Best practice, limiting harm as per National Environmental Management Act No. 107 of 1998	Decommissioning

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
	should be kept to a minimum, so as for later usage as backfill material. • Monitoring should be done to ensure that sediment pollution is timeously addressed • Where structures are removed from nearby watercourses care should be taken not to disturb a larger footprint than needed. • Vehicle movement should be restricted to the minimum that is required for decommissioning. Unnecessary movement of vehicles will increase the degradation of paths and dirt roads leading to increased erosion risk. • Progressive rehabilitation must occur. Rehabilitation has to be take place as soon as decommissioning commences to prevent soil erosion. • Monitoring should be done to ensure that sediment pollution is timeously dressed.				
Introduction and spread of alien vegetation.	• Long-term monitoring for the establishment of alien invasive species within the areas affected by the construction and maintenance and take immediate corrective action where invasive species are observed to establish, as specified in the Alien Vegetation Management Pan • Undertake an Alien Plant Control Plan which specifies actions and measurable targets	ECO	Monitoring and Preventative Measures and Rehabilitation	Best practice, limiting harm as per National Environmental Management Act No. 107 of 1998 Ensure EMPr is adhered to	Decommissioning

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
	• Retain vegetation and soil in position for as long as possible, removing it immediately ahead of decommissioning /earthworks in that area and returning it where possible afterwards. • Rehabilitation must occur concurrently with decommissioning. • The mixture of vegetation seed must be used during rehabilitation. The mix must include: Annual and perennial species, pioneer species, species which are indigenous to the area to ensure there is no ecological imbalance in the area.				
Loss and disturbance of watercourse habitat and fringe vegetation.	• Monitor rehabilitation and the occurrence of erosion twice during the rainy season for at least two years and take immediate corrective action where needed. • Rehabilitate any impacted areas • Where structures are removed from nearby watercourses care should be taken not to disturb a larger footprint than needed. • Vehicle movement should be restricted to the minimum that is required for decommissioning. • Rehabilitation of decommissioned areas must commence concurrently with decommissioning. • Monitor the establishment of alien invasive species within the areas affected by the decommissioning and take immediate	ECO	Monitoring and Preventative Measures and Rehabilitation	Best practice, limiting harm as per National Environmental Management Act No. 107 of 1998 Ensure EMPr is adhered to	Decommissioning

ASPECT/ IMPACT	IMPACT MANAGEMENT ACTIONS	RESPONSIBILITY	METHOD	IMPACT MANAGEMENT OUTCOMES	TIMEFRAMES/ FREQUENCY
	corrective action where invasive species are observed to establish. • Monitor rehabilitation and the occurrence of erosion twice during the rainy season for at least two years and take immediate corrective action where needed				
Changes in water quality	• A detailed rehabilitation plan should be drawn up with the input from a water quality assessment	ECO	Monitoring and Preventative Measures and Rehabilitation	Best practice, limiting harm as per National Environmental Management Act No. 107 of 1998 Ensure EMPr is adhered to	Decommissioning
Loss of aquatic biota	• Monitor the establishment of alien invasive species within the areas affected during decommissioning	ECO	Monitoring and Preventative Measures and Rehabilitation	Best practice, limiting harm as per National Environmental Management Act No. 107 of 1998 Ensure EMPr is adhered to	Decommissioning

9.4.4 Visual

This section deals with the issues relative to visual during the decommissioning phase.

Table 46: Visual

IMPACT/ ASPECT	MITIGATION/MANAGEMENT ACTIONS	RESPONSIBILITY	METHODOLOGY	MITIGATION/MANAGEMENT OBJECTIVES AND OUTCOMES	FREQUENCY
Compaction of larger areas can result in soil sterilisation and landscape degradation.	• Post construction, the laydown areas and other construction areas no longer needed for operational management, should be ripped (0.5m depth) to restore compacted topsoil, and then rehabilitated to natural vegetation under the supervision of the rehabilitation specialist.	Project management and EPC with inputs from rehabilitation specialist.	As defined by the rehabilitation specialist.	Soil sterilization does not take place and large degraded areas do not occur, with overall landscape integrity maintained.	Within 1 year of closure.
Old, unused structures have the potential to significantly degrade the landscape character.	• All structures not required for agricultural purposes post-closure should be removed and where possible, recycled or reused. • Building structures should be broken down (including building foundations) • The rubble should be managed according to the National Environmental Management: Waste Act (Act 59 of 2008) (NEMWA) and deposited at a registered landfill if it cannot be recycled or reused.	Project management and EPC	As defined by the rehabilitation specialist.	The post operation landscape reverts to rural agricultural without landscape degradation created by un-used/ old structures.	Within 1 year of closure.

IMPACT/ ASPECT	MITIGATION/MANAGEMENT ACTIONS	RESPONSIBILITY	METHODOLOGY	MITIGATION/MANAGEMENT OBJECTIVES AND OUTCOMES	FREQUENCY
Windblown dust and dust from moving vehicles have the potential to become a significant nuisance factor to local farms around the site and along the access road.	• Set up a clear management plan with clear accountability structures with set thresholds for triggering of mitigations. • Set up a liaison committee to engage with local farmsteads located within 500m of an access road, with monthly communication with the farm owners on the effectiveness of the dust management procedures.	Project management and EPC (as the issue arises).	Should excessive dust be generated from the movement of vehicles on the roads such that the dust becomes visible to the immediate surrounds, dust-retardant measures should be implemented under authorization of the EPC.	Dust generated on site as well as on the access road to the site, is well managed and does not become a nuisance factor for the workers or the surrounding farmsteads.	On-going

10. AMENDMENTS TO THE EMPR

The ECO has the right to request (in writing) a method statement to be compiled by the contractor in cases where the Construction EMPr may not adequately address the issue or nature of the activity/site warrants the need thereof. The method statement must be approved in writing by the ECO prior to carrying out the activity.

Any major issues not covered in the EMPr as submitted as well as any layout changes, will be addressed as an addendum to the EMPr and must be submitted for approval prior to implementation.

Authorised officials of the Department reserve the right to review the approved EMPr during the construction and operational phases of the above-mentioned activity and amend/add any condition as it is deemed necessary. Authorised officials also reserve the right to inspect the project during both construction and operational phase of development.

11. ENVIRONMENTAL AWARENESS PLAN

Appendix 4 of GN R326 EIA Regulations 2014 (as amended) requires that and Environmental Awareness Plan describes the manner in which "*the applicant intends to inform his or her employees of any environmental risk which may result from their work; and risks must be dealt with in order to avoid pollution or the degradation of the environment*". In recognition of the need to protect our environment, environmental management should not only be seen as a legal obligation but also as a moral obligation.

This Environmental Awareness Plan is intended to create the required awareness and culture with personnel and contractor's / service providers on environmental safety and health issues associated with the development activities.

11.1 Policy on Environmental Awareness

This Environmental Awareness Plan must serve as the basis for the induction of all new employees (as well as contractors depending on the nature of their work on site) on matters as described herein and read in conjunction with the EMPr. The Plan will also be used to hone awareness of all employees on a continuous basis.

Specific environmental awareness performance criteria will also form part of the job descriptions of employees, to ensure diligence and full responsibility at all levels of the organisational work force.

11.2 Implementation of Environmental Awareness

General environmental awareness will be fostered among the project's workforce to encourage the implementation of environmentally sound practices throughout the project's duration. This will ensure that environmental accidents are minimised and environmental compliance maximised.

Environmental awareness will be fostered in the following manner:

- Induction course for all workers on site, before commencing work on site;

- Refresher courses as and when required;
- Daily toolbox talks with all workers on the site at the start of each day, where workers can be alerted to particular environmental concerns associated with their tasks for that day or the area/habitat in which they are working; and
- Displaying of information posters and other environmental awareness material at the general assembly points.

11.3 Training and awareness

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

11.4 Training of construction workers

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

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

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

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

12. CONCLUSION

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

12.1 Pre-Construction Phase

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

12.2 Construction Phase

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

12.3 Operational Phase

The proposed project will have minimal negative effects which mainly relates to loss of aesthetic value and habitat. Most of the negative impacts are minor and the significance of the impacts can be greatly reduced by the implementation of mitigation measures, which are outlined in this EMPr.

12.4 Decommissioning Phase

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

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

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

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

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

Appendix A:

Curriculum Vitae

M/01/2023

CURRICULUM VITAE

Natalie Pullen

Name	Natalie Pullen
Profession	Environmental Consultant
Name of Firm	SiVEST SA (Pty) Ltd
Present Appointment	Divisional Manager: Environmental & Marketing Division
Years with Firm	1 year
Date of Birth	21 April 1976, Durban
ID Number	7604210021087
Nationality	South African

Education

- Port Shepstone High School, 1993
- Rhodes University, 1994 – 1997, 2001

Professional Qualifications

- M.Sc. Environmental Biotechnology, Rhodes University, 2002
- B.A. Honours in Geography, Rhodes University, 1998
- B.A. Geography and Psychology, Rhodes University, 1997

Memberships to Professional Bodies

- EAPASA Registered Environmental Assessment Practitioner (Registration Number: 2018/132)
- Green Star SA Accredited Professional – New Buildings (Green Building Council of South Africa)
- EDGE Accredited Professional (Green Building Council of South Africa)
- Professional Member of the South Africa affiliate of the International Association of Impact Assessment (IAIAsa) (membership no 5170). Served on the National Executive Council as the Chairperson of Gauteng Branch Committee (2017 – 2021)
- Professional Member of the Institute of Waste Management South Africa (membership no 10117002)

Employment Record

Jan 2022 – current	SiVEST SA (Pty) Ltd: Divisional Manager: Environmental & Marketing
Jan 2016– Dec 2021	PENSU Environmental Consulting (Pty) Ltd: Director and Environmental Consultant
Jan 2010 – Dec 2015	Home Educator
Aug 2004 – July 2010	Self-Employed: Environmental Consultant
May 2002– July 2004	ARCUS GIBB (Pty) Ltd: Senior Environmental Consultant
Oct 2001 – Apr 2002	Department of Water Affairs and Forestry: Water Quality Management, Eastern Cape Region: Principal Water Pollution Control Officer
May 2000 – Sept 2001	Department of Water Affairs and Forestry: Eastern Cape Region: Principal Geographer
Jan 1998 – Apr 2000	Department of Water Affairs and Forestry: Water Utilisation Head Office, Senior Geographer

M/01/2023

CURRICULUM VITAE

Natalie Pullen

Language Proficiency

LANGUAGE	SPEAK	READ	WRITE
English	Excellent	Excellent	Excellent
Afrikaans	Good	Good	Good

Years of Work Experience: 19 years

Countries of Work Experience

- South Africa

Fields of Specialisation

- Integrated Environmental Management
- Environmental Assessments
- Environmental Management Plans
- Environmental Monitoring and Compliance Auditing
- Decommissioning and Rehabilitation Plans
- Integrated Waste Management
- Waste Management Licensing
- Integrated Waste Management Plans
- Integrated Water Resource Management
- Water Use Licensing
- Water Conservation and Demand Management Plans

Overview

Natalie is an EAPASA registered Environmental Assessment Practitioner with 19 years of experience. Having started her career at the then-Department of Water Affairs and Forestry, she gained experience at both the strategic and implementation level of the Regulatory Authority, being based at both the Head Office and the Eastern Cape Regional Office. After completing her MSc in Environmental Biotechnology, Natalie ventured into environmental consulting. Over the years she has gained experience in the suite of integrated environmental tools accessible to the EAP, including the undertaking of various environmental studies such as environmental impact assessments, environmental management plans and programmes, waste management licencing, and compliance monitoring and auditing. Her work has required the management of internal project teams as well as the team of specialists; the preparation of environmental reports, in accordance with published guidelines; and the facilitation and co-ordination of public participation processes as integral parts of environmental studies.

Having led her own company for five years, she has been responsible for the direction and control of all business operations; overseeing the financial administration - budgeting and setting of targets; ensuring continuous business development through networking, marketing and servicing of existing clients; undertaking quality management of all products and reports; promoting the growth and development of staff, providing mentorship and training. This has prepared her well for her role as Divisional Manager at SiVEST.

CURRICULUM VITAE

Natalie Pullen

Projects Experience

ENVIRONMENTAL PLANNING / STRATEGIC PROJECTS

Pre-feasibility Studies/Screening

- Juwi Renewable Energies: Site Screening of 6 greenfield sites – Project Leader, EAP (SiVEST SA, 2022)
- Department Sports, Arts and Culture: Environmental Screening of Archives Buildings – Project Leader (SiVEST SA, 2022)
- WastePlan Holdings: Environmental Due Diligence Audit of SmartMatta's four facilities – EAP (PENSU Environmental, 2020).
- Ka-Siphiwo Family: Environmental Screening and Basic Assessment for the proposed Mgxabakazi mixed use development– EAP (PENSU Environmental, 2018).
- Provincial Department of Human Settlements: Qunu City Environmental Screening – EAP responsible for determining what environmental authorisations will be required for the proposed development of the Qunu City to commemorate Mr Nelson Mandela. (ILISO Consulting Environmental Management, 2016).

Natural Resource Management (Environmental Rehabilitation)

- Johannesburg City Parks and Zoo: Basic Assessment for upgrading of Visitors Centre and Staff Accommodation for Kloofendal Nature Reserve – EAP (IKAMVA Consulting, 2020).
- Johannesburg City Parks and Zoo: Rehabilitation of the illegally constructed boardwalk in Klipsriviersberg Nature Reserve – Project EAP responsible for overseeing the implementation of the rehabilitation plan (IKAMVA Consulting, 2018).
- Hope Restoration Ministries: Rehabilitation Plan for the illegal construction of a boundary wall through a wetland – Project leader, co-ordinating specialist studies (PENSU Environmental, 2018).
- Kolosus Automotive Leathers: Bidhli Farm Rehabilitation where soils had been contaminated by heavy metals from King Tanning (ARCUS GIBB, 2002).

Environmental Management Plans

- Sobek- Dube Tradeport Special Economic Zone: Gap Analysis and Environmental Strategy Review – EAP (Myezo Environmental Management Services, 2021)
- Dr Nkosazana Dlamini Zuma Local Municipality: Environmental Management Plan – Project Manager and EAP (IKAMVA Consulting, 2019).
- Chris Hani District Municipality: Integrated Environmental Management Plan – Project leader responsible for preparing the IEMP (IKAMVA Consulting, 2018).
- Ngwathe Local Municipality: Integrated Environmental Management Plan – Project leader responsible for preparing the IEMP (MDT Environmental (previously ILISO Consulting Environmental Management), 2016-2017.

Integrated Waste Management Plans:

- Vantablack Technology: Waste Management Plan – EAP (PENSU Environmental, 2021).
- Inxuba Yethemba Local Municipality: Integrated Waste Management Plan – Reviewer of the IWMP (IKAMVA Consulting, 2018).
- City of Ekurhuleni Metropolitan Municipality: Waste Impact Report for Weltevreden Landfill Site and Plastic City Informal Settlement – Reviewer and contributor of the WIR (NGT Holdings, 2018).
- Dawid Kruiper District Municipality: Integrated Waste Management Plan – Reviewer of the IWMP (IKAMVA Consulting, 2017).
- Dr Kenneth Kaunda District Municipality: Integrated Waste Management Plan – Reviewer and contributor of the IWMP (IKAMVA Consulting, 2017).
- City of Ekurhuleni Metropolitan Municipality: Review of the Environmental Impact Assessment for the Proposed Establishment of a GLB- Landfill Site on the Farm Zesfontein 27 IR (Strategic Environmental Focus, 2004).
- OR Tambo District Municipality: OR Tambo Waste Management and Capacity Building (ARCUS GIBB, 2003).

M/01/2023

CURRICULUM VITAE

Natalie Pullen

ENVIRONMENTAL IMPACT ASSESSMENTS

Energy:

- Juwi South Africa: Mayogi Solar PV Facility (SiVEST SA, 2023) – Project Manager.
- Juwi South Africa: Hartebeest Wind Energy Facility (SiVEST SA, 2023) – Project Manager.
- Juwi South Africa: Outeniqua Wind Energy Facility Bird & Bat Monitoring (SiVEST SA, 2023) – Project Manager.
- ABO Wind: Ujekamanzi Wind Energy Facility Cluster (SiVEST SA, 2023) – Project Manager.
- ABO Wind: Serval Solar PV Facility Cluster (SiVEST SA, 2023) – Project Manager.
- Enertrag South Africa: Hendrina South132kV Powerline BA (SiVEST SA, 2023)
- Mainstream Renewable Power SA: Ceres Wind Energy Facility Cluster (SIVEST SA, 2022) – Project Manager.
- Mainstream Renewable Power SA: Beaufort West Wind Energy Facility Cluster (SIVEST SA, 2022) – Project Manager.
- Mainstream Renewable Power SA: EA Amendments (SiVEST SA, 2022) – Project Manager.
- Enertrag South Africa: Hendrina North 132kV Powerline BA (SiVEST SA, 2022)
- Enertrag South Africa: Lesaka Solar Energy Facilities EIAs (SiVEST SA, 2022)
- Eskom Holdings SOC: Iphiva Substation EIA (SiVEST SA, 2022)
- Eskom Holdings SOC: Northern KwaZulu-Natal Strengthening Project – EAP as part of team undertaking EIA for Substation, two 400kV powerlines and a BAR for 132kV Distributions Lines. (MDT Environmental, 2017).
- Eskom Holdings SOC: Majuba-Umfolozi Transmission power line EIA (ILISO Consulting, 2005).
- Eskom Holdings SOC: Braamhoek Pumped Storage Scheme Mining Application (ARCUS GIBB, 2005).

Roads and Bridges:

- City of Ekurhuleni Metropolitan Municipality: Fare Policy – Project Administration Support. (MDT Environmental, 2017).
- City of Tshwane Metropolitan Municipality: BRT System – Project Administration Support. (ILISO Consulting Environmental Management, 2016).
- Trade Routes Shopping Centre: Loop and Access Road Scoping Report (Strategic Environmental Focus, 2004).

Pipelines:

- Department of Water and Sanitation: Limpopo Pipelines Project – BAR for Borrow Areas associated with the Limpopo Pipelines Project. (ILISO Consulting Environmental Management, 2016 – 2017).

Ports/Marine Infrastructure:

- National Ports Authority: Ambrose Park Environmental Assessment (ARCUS GIBB, 2004).

Water Supply Schemes:

- King Sabata Dalindyebo Municipality: Upper Mhlahlane Water Supply Scheme Scoping Study.
- OR Tambo District Municipality: Upper Corana Water Supply Scheme Scoping Study (ARCUS GIBB, 2003).

Cemeteries:

- Buffalo City Municipality: Cemeteries Branch: Mzamomhle Cemetery Investigation: Site Selection (ARCUS GIBB, 2002).
- Buffalo City Municipality: Cemeteries Branch: Regional Cemetery Investigation: Site Selection (ARCUS GIBB, 2002).

Chemical Industry

- J Warren Sun Ace: Basic Assessment of the Proposed Storage of Dangerous Goods, 7 Willcox Road, Prospecton – Project Manager and EAP (PENSU Environmental, 2021).

CURRICULUM VITAE

Natalie Pullen

Automotive Industry

- BMW South Africa: Midrand Campus: Biodiversity Assessment for BMW SA Midrand Campus – Project Manager (PENSU Environmental, 2019 & 2021).
- BMW South Africa: Plant Rosslyn: Biodiversity Assessment for BMW SA Plant Rosslyn – Project Manager (PENSU Environmental, 2019 & 2021).

Petrol Filling Stations:

- Trade Routes Shopping Centre: Filling Station Scoping Report (Strategic Environmental Focus, 2004).

Mixed use/Business Park/Logistics/Shopping Centre:

- Hope Restoration Ministries: Basic Assessment for the proposed establishment of a place of worship for – EAP (PENSU Environmental, 2018).

Residential:

- Vikisi Villa: Basic Assessment for proposed upmarket residence – EAP (PENSU Environmental, 2021).
- Siyabona Prop: Siyabonaville Township Establishment – Project Manager and EAP (PENSU Environmental, 2019).
- Hugo Erasmus Property Development: Basic Assessment for proposed residential township establishment in Naauwpoort, Emalahleni – EAP (Life4All Environmental Consultancy, 2018).
- The Homeless People Co-operative Limited: Basic Assessment for the proposed Witkoppies residential township establishment – EAP (Life4All Environmental Consultancy, 2018).
- Wietpro Housing: Dersley Environmental Scoping (ARCUS GIBB, 2004).
- Wietpro Housing: Newmarket Environmental Scoping (ARCUS GIBB, 2004).
- Property Hunt: Brentwood Environmental Scoping (ARCUS GIBB, 2004).
- Property Hunt: Dersley Environmental Scoping (ARCUS GIBB, 2004).
- Property Hunt: Norton Park Environmental Scoping (ARCUS GIBB, 2004).

Agriculture

- Department of Correctional Services/ Blessed Engineering Solutions: S22A Air Emission Licence for Leeuwkop Correctional Centre Abattoir – Project Manager (PENSU Environmental, 2020).
- Home Grown With Love: Basic Assessment for the proposed aquaculture facility – Project leader, EAP (SiVEST, 2022).
- Integrated Aquaculture: Basic Assessment for the proposed aquaculture facility – Project leader, EAP (SiVEST, 2022).
- Lwando Piggery: Basic Assessment for the proposed sow piggery – Project leader, EAP (PENSU Environmental, 2018).
- Nterra Solutions: Basic Assessment for the proposed aquaculture and aquaponics facility – EAP (PENSU Environmental, 2018).

Waste Management

- EnviroServ: Updating of EMPr for Roodepoort Incinerator– EAP (Life4All Environmental Consultancy, 2021).
- WastePlan Gauteng: Applications and renewal applications for various waste permits and registrations – (PENSU Environmental, 2021).
- BMW South Africa: Plant Rosslyn: Updating the Operational Environmental Management Programme for BMW SA Plant Rosslyn – EAP (PENSU Environmental, 2020).
- Mandini Wealth: Updating of Mandini Wealth Tyre Pyrolysis Environmental Management Plan – EAP (Life4All Environmental Consultancy, 2020).
- Enviro-Plastic Resin: Waste Management Licence – EAP responsible for undertaking the BAR for the Waste Management Licence (Life4All Environmental Consultancy, 2017).

- Siyandisa Waste Services: Environmental Impact Assessment Report for the Proposed 1 Military Hospital Pilot Hydroclave (Life4All Environmental Consultancy, 2008).
- Siyandisa Waste Services: Environmental Impact Assessment Report for the Proposed Sandton Medi-Clinic Pilot Hydroclave (Life4All Environmental Consultancy, 2008).
- Buffalo City Municipality: Waste Management Services: West Bank Transfer Station: Site Selection and Permitting (ARCUS GIBB, 2002).
- Buffalo City Municipality: Waste Management Services: Cambridge Transfer Station: Site Selection and Permitting (ARCUS GIBB, 2002).
- Buffalo City Municipality: Waste Management Services: East London Regional Waste Disposal Site: Hazardous Waste Permit Upgrade (ARCUS GIBB, 2002).

Section 24G

- Ragimana Family Trust: Section 24G Rectification Application for the unauthorised clearing of 300m^2 a residential home – Project leader, EAP (PENSU Environmental, 2019).
- Standard Bank: Mogale's Gate Farm Section 24G - Project Leader, EAP (SiVEST SA, 2022).

ENVIRONMENTAL MONITORING AND AUDITING

- Vikisi Villa: ECO for construction of upmarket residence – Project Leader, ECO (SiVEST SA, 2022).
- Rejem: ECO for the construction of the Newmarket Retail Centre (SiVEST SA, 2022).
- Rejem: ECO for the construction of the Netcare Alberton and Medimix Facility (SiVEST SA, 2022).
- BMW South Africa – Plant Rosslyn: Tank Compliance Audit – Project Manager (SiVEST SA, 2022).
- BMW South Africa Plant Rosslyn: External Compliance Audit of Water Use Licence – Project Manager (SiVEST SA, 2022).
- Sundale Free Range Dairy: External Compliance Audit of Sundale's Environmental Authorisation and Waste Management Licence – Project Manager (SiVEST SA, 2022).
- BMW South Africa – Plant Rosslyn: Tank Compliance Audit – Environmental Auditor (PENSU Environmental, 2020 & 2021).
- BMW South Africa: Plant Rosslyn: External Compliance Audit according to the Norms and Standards for BMW SA Plant Rosslyn – Waste Licence Auditor (PENSU Environmental, 2021).
- BMW South Africa Plant Rosslyn: External Compliance Audit of Water Use Licence – Environmental Auditor (PENSU Environmental, 2021).
- Sundale Free Range Dairy: External Compliance Audit of Sundale's Environmental Authorisation and Waste Management Licence – Environmental Auditor (PENSU Environmental, 2021).
- Remade Recycling: External Compliance Audit of the Norms and Standards for Storage and Baling for Remade Randfontein Branch, Wynberg Branch, Germiston Branch, Newtown Branch, Mpact Midrand – Waste Licence Auditor (Life4All Environmental Consultancy, 2021).
- Remade Recycling: External Compliance Audit of the Norms and Standards for Storage and Baling for Remade Rustenburg Branch, Pretoria West Branch – Waste Licence Auditor (Life4All Environmental Consultancy, 2020).
- SmartMatta: External Compliance Audit of SmartMatta Denver's Waste Management Licence – EAP (PENSU Environmental, 2020).
- BMW South Africa: Plant Rosslyn: External Compliance Audit of the Waste Management Licence for BMW SA Plant Rosslyn – Waste Licence Auditor (PENSU Environmental, 2019).
- Alex Plastics: External Compliance Audit of the Waste Management Licence – Waste Licence Auditor (Life4All Environmental Consultancy, 2017).
- Remade Recycling: External Compliance Audit of the Waste Management Licence for Remade Rustenburg, Remade Randburg, Remade Randfontein – Waste Licence Auditor (Life4All Environmental Consultancy, 2017).
- Mandini Wealth: Internal Compliance Audit of Mandini Wealth's Environmental Authorisation – Waste Licence Auditor (Life4All Environmental Consultancy, 2017-2021).

- Eskom Holdings SOC: Thuso Substation Close-out Audit – EAP responsible for undertaking the Close-out audit as part of the project's Environmental Authorisation. (ILISO Consulting Environmental Management, 2016).
- Buffalo City Municipality: Waste Management Services: Co-ordination of Environmental Monitoring for East London Regional Waste Disposal Site (including Monitoring Committee) (ARCUS GIBB, 2002).

DECOMMISSIONING, CLOSURE, AND REHABILITATION

- Mpact Polymers: Waste Management Licence for the decommissioning of the rPET Recycling Plant, Wadeville – EAP (Life4All Environmental Consultancy, 2021).
- WastePlan Holdings – SmartMatta: Decommissioning of SmartMatta's Waste Management Facility in Prospecton – EAP (PENSU Environmental, 2020).
- BMW South Africa: Plant Rosslyn and Vehicle Distribution Centre: Establishment of Environmental Liability Associated with Decommissioning and Restoration Activities in Accordance with South African Legislation and International Standards – Project Manager (PENSU Environmental, 2020).
- OSHO: Decommissioning of Tyre Pyrolysis Plant, Klerksoord – EAP (Life4All Environmental Consultancy, 2019).
- EnviroServ: Decommissioning of Health Care Risk Waste Incinerator in Bloemfontein – EAP (Life4All Environmental Consultancy, 2019).
- Buffalo City Municipality: Waste Management Services: Ducats Waste Disposal Site: Closure and Rehabilitation (ARCUS GIBB, 2002).

SAFETY, HEALTH AND ENVIRONMENT

- WastePlan Holdings: SHEQ Management Consulting Services. Implementation of Integrated Management System - ISO14001, ISO 45001, ISO 9001 (PENSU Environmental 2021).

WATER PROJECTS

Planning

- Sasol Impumelelo Mine: Water Conservation and Demand Management Plan – Project Leader (SiVEST SA, 2022).
- 2 Seam Colliery Vlaklaagte: Water Conservation and Demand Management Plan – EAP (MDT Environmental, 2020).
- Department of Water Affairs and Forestry: Waterval River Water Quality Management Plan (ILISO Consulting, 2004).
- Botswana Department of Water Affairs: Selebi-Phikwe Water Supply Master Plan (ILISO Consulting, 2005).

Water Use Licence

- Standard Bank Mogale's Gate: Water Use Licence Application (SiVEST SA, 2023) – Project Leader, EAP (SiVEST SA, 2022).
- Renishaw Hills Coastal Precinct: Water Use Licence Application (SiVEST SA, 2023) – Project Leader, EAP (SiVEST SA, 2022).
- Eskom Holdings SOC: Erica Substation WULA (SiVEST SA, 2023) – Project Leader, EAP (SiVEST SA, 2022).
- Eskom Holdings SOC: Water Use Licence Application for SVR Cable and Powerline Infrastructure, Sasolburg – EAP (PENSU Environmental, 2021).
- BMW South Africa Plant Rosslyn: External Compliance Audit of Water Use Licence – Environmental Auditor (PENSU Environmental, 2021).
- BMW South Africa Plant Rosslyn: Water Use Licence Application – EAP (PENSU Environmental, 2020).

- Motha Global: Water Use Licence for a River Crossing of a Sewer Pipe Upgrade for Ferndale Residential Development – (PENSU Environmental, 2019).
- TKDS Consulting and Supplies: Bhisho Office Precinct – Water Use Licence Application. (ILISO Consulting Environmental Management, 2016).

VISUAL IMPACT ASSESSMENT

- Midway Drags: Visual Impact Assessment Report (Life4All Environmental Consultancy, 2010).

TRAINING

- Mandini Wealth: Preparation of Environmental Training Material for Tyre Pyrolysis Plant – (Life4All Environmental Consultancy, 2018).

Courses / Conferences / Workshops

- Environmental Law Short Course: EnviroQuest, PE Technikon, 2000.
- Applied Course in Aquatic Ecotoxicology: Centre for Aquatic Toxicology, IWR, Rhodes University, 2001.
- Environmental Conflict Management: presented by Prof Rob Midgely from the Law Department, Rhodes University, 2001
- Environmental Management Systems and ISO 14001 presented by Dr Malcome Logie Biotechnology and Environmental Specialist Consultancy, 2001.
- Safety, Health and Environmental Management Systems and ISO 18001 presented by Dr Malcome Logie, Biotechnology and Environmental Specialist Consultancy, 2001.
- Integrated Environmental Management and Environmental Impact Assessment presented by Dr Ted Avis from the Botany Department and Director of Coastal and Environmental Services, 2001.
- Water Quality Management Orientation Course: presented by Department of Water Affairs and Forestry, Pretoria, 2001, with distinction.
- TUKS 1B Advanced Water Quality Management Course: presented by University of Pretoria, 2001, with distinction.
- Green Building Council of South Africa, Accredited Professional New Buildings Course, 2017.
- EDGE Expert Course, 2017.
- 2017 Amendments to the Environmental Impact Assessment Regulations Workshop: presented by IMBEWU Sustainability Legal Specialists (Pty) Ltd, 2017.
- ECO Workshop: The Roles and Responsibilities of Environmental Control Officers and Site Environmental Staff – hosted by IAIAsa Gauteng Branch. 2017.

Publications and Research

- Warren MHH, and **Pullen (née Barratt)** N, Department of Water Affairs and Forestry. October 1999. Stream Flow Reduction Activities: Combined licensing and authorisation guidelines. Pretoria.
- Warren MHH, and **Pullen (née Barratt)** N, Department of Water Affairs and Forestry. November 1999. Water-Use Licensing: the policy and procedure for licensing Stream Flow Reduction Activities. Pretoria.
- Versfeld D, Steyl I, le Roux C, **Pullen (née Barratt)** N, Department of Water Affairs and Forestry. October 1999. A manual for the implementation of Strategic Environmental Assessments in the water sector.
- Nelson, Peter, Versfeld D, Steyl I, le Roux C, **Pullen (née Barratt)** N, Department of Water Affairs and Forestry. December 1999. Strategic Environmental Assessment Methodology Report.
- **Pullen N,** Rhodes University Department of Biochemistry, Microbiology and Biotechnology. An investigation into Bioleaching for the Treatment of Heavy Metal Contaminated Soil, Thesis submitted in partial fulfilment of the requirements for the degree of Master of Science Environmental Biotechnology, December 2001 Supervisors: Clark Ehlers and Dr. Kevin Whittington-Jones.

Appendix B:

Environmental Incidents

LOG Environmental Incident Log

ENVIRONMENTAL INCIDENT LOG				
Date	Env. Condition	Comments *(Include any possible explanations for current condition and possible responsible parties. Include photographs, records etc. if available)*	Corrective Action Taken (*Give details and attach documentation as far as possible)*	*Signature*

Appendix C:

Complaints Record Sheet

Complaints Record Sheet

COMPLAINTS RECORD SHEET	File Ref: Page …. of ….	DATE: ……
COMPLAINT RAISED BY:		
CAPACITY OF COMPLAINANT:		
COMPLAINT RECORDED BY:		
COMPLAINT:		
PROPOSED REMEDIAL ACTION:		
EO: _____ Date: _____		
NOTES BY ECO:		
EO: _____ Date: _____ Site Manager: _____ Date: _____		

Appendix D:

Summary of Specialist Findings and Recommendations

SUMMARY OF SPECIALIST FINDINGS AND RECOMMENDATIONS

Specialist Study	Findings	Recommendations
Agricultural Assessment	The sensitivity analysis has identified the project area to have a Medium to Low sensitivity, with small areas of High sensitivity where existing agricultural fields are. therefore, an Agro-ecosystem impact assessment is required. The desktop results as well as the field verification and detailed soils assessment have determined that the agricultural potential is rated as Medium to High based on the climatic conditions as well as the soils identified on site. The following indicates the desktop and in field findings: <u>Desktop Results;</u> • DEA screening assessment determined the agricultural sensitivity to be Medium to Low, with small areas of High; • The project has small areas of crop field boundaries; • The desktop land capability rated the project area as Low to Low-Moderate with a small portion to the east being rated as Moderate; • The climate capability was determined to be Moderate; • The desktop soil capability rated the project area as Very-Low with a small portion to the east being rated as Moderate. A very narrow edge of Moderate-High capability occurs on the northern edge of the project area; and • The desktop grazing capability rated the project area as 5ha/LSU. <u>Site Assessment Results;</u> • Land capability was determined as grazing to light cultivation; • Land potential was determined to be L2 (high potential) to L4 (moderate potential); and • Land use showed natural grasslands used for cattle grazing and small areas of maize farming.	The specialist opinion is that the proposed project can be considered favourably from an agricultural and soils impact perspective based on the following: • The DFFE screening tool showed very small areas of potential High sensitivity areas. • These areas were isolated to the existing crop farming areas in the western edge of the project. • The land capability is marginal with limited soil depth and a light cultivation to grazing capability only. • Based on the site layout no Solar PV sites fall within the L2 land potential. The impacts are considered Moderate impact. • Additionally, the alternative substation falls within the L2 land potential. Therefor it is the specialist opinion that the preferred substation be selected. • The high potential land capability (L2; category B) must be retained for agricultural use due to the limited availability of high potential land, as per departmental guidelines. • The only mitigation measure that will reduce the impact level is by avoiding the high potential (L2) areas completely.
Aquatic Assessment	The site assessment confirmed the presence of two wetland types. The watercourses are further classified as follows: ➢ Channelled Valley Bottom Valley;	It is advised that the structures remain outside of the wetlands and associated buffer zones. The risk scores fall in the Low category.

Specialist Study	Findings	Recommendations
	➢ 2 Hillslope Seepage Wetlands The current footprint of the Solar and associated infrastructure does not encroach into the wetland and associated buffer areas. Although the exact footprint positions of the pylons were not known during the writing of this report it is assumed that it will span the wetlands and buffer zones with no pylons located in these areas. The proposed substations are not located on any wetland or wetland buffer zone. Prior to the proposed mitigation measures most impacts rated moderate and post mitigation they ranked low in both the construction and operational phase.	
Terrestrial Biodiversity Assessment	Based on the SSV and field survey, the Terrestrial Biodiversity theme was confirmed to have Very High sensitivity, while the Sensitive Plant Species theme was confirmed to have High sensitivity owing to presence of protected species. The study areas are located within natural systems in the Endangered Eastern Highveld Grassland and Steenkampsberg Montane Grassland vegetation units. The study area is located primarily in CBA Optimal, Other Natural Areas, Heavily Modified, and a small section in CBA Irreplaceable and Moderately Modified. Areas of high biodiversity value including CBA Irreplaceable and Optimal should be avoided as far as possible concerning transformation of land cover; accordingly, all permanent infrastructure such as the BESS, substation and O&M Building must be located outside these sensitive areas. All temporary infrastructure including the site camp required during the construction phase, must also be located outside high sensitivity areas. The Primary Grassland and Watercourse is considered to have Very High SEI, especially with regards to the presence of sensitive plant species, suitable habitat for sensitive plant species and important ecosystem functions. Accordingly, transformation of these habitats is not supported (no destructive development activities should be considered) as avoidance mitigation is required wherever possible and changes to project infrastructure design must be done to limit the amount of habitat impacted. Therefore, only limited development activities of low impact will be acceptable.	• Rehabilitation and monitoring plan required post-construction and post-operational phase of the project which addresses ecosystem functioning, fire management, alien invasive species management and effective methods of rehabilitating natural vegetation to functional systems (not just biomass replacement). • Roads and underground cabling must avoid sensitive areas as far as possible by considering various layout alternatives. The karoo shrubland habitat will not be transformed completely (only PV related – this is not the case for roads and temporary laydown areas), accordingly with appropriate mitigation and rehabilitation measures post-construction and post-operational, the impact of the PV panels is considered medium for grassland. • It is advised that an ecological specialist is appointed during the construction, operational and decommissioning phases to monitor impacts and related mitigation measures regarding natural and sensitive habitats and the faunal and floral assemblages occurring there.

Specialist Study	Findings	Recommendations
	Linear infrastructure such as roads and internal powerlines can cross the watercourses, but care should be taken in the planning of this. The aquatic biodiversity assessment must also be consulted for additional mitigation measures to be considered during the design phase, as well as the construction and operational phases of the projects. A sensitive plant species, K. carolinensis was recorded in Primary Grassland which should be protected in situ and must be avoided by the proposed development. A 200m buffer has been placed around its location. The DDT Aloe verdoorniae was also recorded in Primary Grassland and could also occur within the Rocky Grassland. All suitable habitat for the species has been mapped and included as high sensitivity including suitable habitat for other sensitive plant species. For provincially listed species which are affected by the proposed development, a permit application for their removal must be applied for with the provincial authority prior to the commencement of construction activities.	• Care should be taken not to unnecessarily clear or destroy natural vegetation. • Development and planned activities should therefore be planned in such a way that totally transformed areas are chosen for major developments and natural veld and especially any highly sensitive areas are avoided as far as possible. • Provincially listed species which are affected by the proposed development require a permit application for their removal from the provincial authority prior to the commencement of construction activities.
Avifaunal Assessment	The PA is located in a region dominated by natural grassland, drainage lines, disturbed grassland, cropland and stands of alien invasive trees. Several drainage lines and small farm dams can be found scattered across the PA with most being mostly permanent with some seasonal flow/ inundation. The powerline infrastructure that traverses the PAOI is a significant habitat for Martial Eagles and other raptors. Fifteen (15) priority species were predicted during the initial surveys, including Secretarybirds, Martial Eagles, Black-chested Snake Eagle, Southern Bald Ibis and White Storks Of these, the Secretarybirds and Martial Eagle were the most concerning large bird species. At the commencement of the survey, the PAOI was characterised by an extreme rainfall event (wet season) may have atypically transformed the PAOI where it is possible that increased densities (and perhaps diversity) of avifaunal assemblages may have been recorded due to an abundance of high forage value habitat. However, although the density and diversity of Priority Species was high, most of these species were common and widespread and largely synanthropic (water and natural grassland associates excluded) and the density and diversity of SCC was very low.	• The addition of the proposed Roos SEF does indicate some (relatively few) potentially significant impacts (without mitigation) to the receiving environment via the risk to Priority Species (such as Secretary Bird, Martial Eagle, and Denham's Bustard and Southern Bald Ibis) and need to be considered with provision made within the EMPr for this development. • Although previous impact assessments and monitoring programs for existing local SREFs indicated that not all impacts can be mitigated to acceptable levels, medium significance post-mitigation should be interpreted that more can be done to avoid critically important species-specific (especially Martial Eagle and Secretary Bird impacts as is the case for the impacts discussed within this statement). This is mainly because impact assessments regarding solar

Specialist Study	Findings	Recommendations
		energy developments have been poorly understood since their inception and the impacts (especially cumulative impacts) of solar developments may have significant consequences if mitigation and monitoring is not implemented correctly. • Overall, it is still the opinion of the consultants that the impacts associated with SEF projects are far preferable (from an environmental impact perspective) to extractive and/ or non-renewable alternatives or even Wind Energy Facilities (WEF). It must be related that this report must be considered in context with the greater EIA process which factors in economic desirability etc. • In addition, while striving to maintain the highest standards of mitigation and monitoring as well as the commissioning of a highly detailed pre-construction micro siting assessment, developments such as the Roos SEF should be encouraged within designated areas. • The roosting of Martial Eagles and the foraging of Secretarybirds is of some concern. • Avoidance mitigation must be implemented in conjunction with the aforementioned micro siting as well as technological applications such as perch diverters, flappers and possibly taping over solar panels in the case of Lake Effect impacts. Thus, the author will look to support Environmental Authorisation (EA) based upon the following conditions: o All recommended No-Go buffering must be strictly adhered to;

Specialist Study	Findings	Recommendations
		o Micro siting of panel placement must occur prior to construction and should be supervised by a specialist zoologist in order to mitigate habitat loss and collision risks for species; o All recommended mitigation measures described above must be applied; o The EMPr must be updated every three years in order to reevaluate the potential distributional population changes of species such as Martial Eagles and Southern Crowned Cranes Thus, technological mitigations such as monitoring, flapper and diverter technology may have to be re-positioned, re-calibrated and updated. • Since the immediate area comprising approved or pending SEFs are expected to cumulatively result in a Moderate impact significance to avifauna after the application of the recommended mitigation measures, and since the combined area will likely contribute moderately to the total land area in the region transformed by renewable energy projects, it is recommended that the development may proceed on condition that: • All mitigation measures stipulated above are adhered to and captured in an Environmental Management Plan (EMP); • The EMP must include the necessity for post-construction avifauna monitoring as stipulated in Jenkins et al., (2015);

Specialist Study	Findings	Recommendations
		• All updated mitigation recommendations issued post-construction (informed by monitoring) must be adhered to Ultimately, the specialist recommends that the project be given a positive authorisation based upon the avifaunal baseline and Environmental Impact Assessment.
Heritage Assessment	The broader area surrounding this proposed for this development is known for a variety of kinds of heritage resources including Stone Age and Iron Age archaeology, significant structures and living heritage sites such as significant baobab trees as well as burial grounds and graves. The survey results confirm these findings. The survey proceeded with limited constraints and limitations, and the project area was comprehensively surveyed for heritage resources. The Iron Age remains identified in the field assessment likely reflect a much more extensive past settlement and as such, CTS Heritage has mapped out the areas of high archaeological sensitivity associated with this. These areas are reflected in RED in the maps above and must be considered strict no-development areas as the likelihood of impacting significant archaeological heritage in these areas is VERY HIGH.	There is no objection to the proposed development from a heritage perspective on condition that: • A no development buffer of 100m is implemented around site 004. This is largely respected in the final layout provided. • A no development buffer of 100m is implemented around site 003 and 009. This is respected in the final layout provided. • The identified sensitive archaeology areas are not impacted by the development of any new infrastructure, including fencing. This is largely respected in the final layout provided. • A Heritage Management Plan and Heritage Agreement are drafted for the ongoing conservation of the significant Iron Age resources identified. • Should any buried archaeological resources or human remains or burials be uncovered during the course of development activities, work must cease in the vicinity of these finds. The South African Heritage Resources Agency (SAHRA) must be contacted immediately in order to determine an appropriate way forward.
Social Impact Assessment	The proposed development site is next to the N4 Highway between Gauteng and Mbombela. The Emakhazeni Municipality is mainly a rural municipality. The area	The proposed project does not present any socio-economic fatal flaws and the project should go ahead. The benefits of the proposed project exceed the negative

Specialist Study	Findings	Recommendations
	serves as a gateway to the tourism parks and private reserves in the Lowveld areas of the Province. There are no tourism related destinations within 15 km from the site. The proposed development is in Ward One of the Municipality which will be most affected by the direct socio-economic impacts of the project. Whereas the total population of Emakhazeni is in the order of 54 400 in 2022/3, the population of Ward One was 5 853 in 2011. The community of Ward One is poor working mainly on the farms and mines in the region with an average annual income of R29 400 per household in 2011 and with a high unemployment rate of more than 24%. Most of the formally employed persons work in the agriculture and mining sectors. Ninety-nine percent (99%) of the population in Ward One is from the Black population group with an even male and female gender split. The population is a young population with a mean age of 23 years and 46% of the people are younger than 19 years of age. About 5% of the population is older than 60 years. The 'no-go' alternative will result in no direct socio-economic impacts from the proposed project on the site or surrounding local area although, it does means that some economic employment opportunities will be lost for the local community. The socio-economic benefits and disadvantages of the proposed project relates to the broader environment outside of the site and do not relate to the specific solar site and grid infrastructure. The identification of preferred site options is not sensitive to the socio-economic impacts. There are no other renewable energy projects within 15 km of the proposed PV project. Although the broader project area is known for its mining activities within 50 km from the site, the location of the site, which on the north of the N4, share few socio-economic impacts with the mines. It is therefore assessed that the proposed project will not contribute to the cumulative socio-economic impacts in the local area.	socio-economic impacts as well as the no-go option. Given that renewable energy development is highly desirable in South Africa from a social, environmental and development point of view, the positive economic and social opportunities lost under the no-go option renders it as an unattractive alternative. It is recommended that the proposed project proceed with the following actions being undertaken: • Implementation of the mitigations. • Review comments received from members of the public, key stakeholders, and any organ of state during the public review process. • Prepare a SIA Report for inclusion in the BA Report to be prepared for the project.
Transportation	The development is located along the N2 national route. It is reachable from likely points of supply through an existing road network that is in good and suitable	With reference to this report, associated assessment and the findings made within, the Roos Solar Energy Facility

Specialist Study	Findings	Recommendations
Impact Assessment	condition, including for the transportation of abnormal loads. Two accesses to the facility already exist in the form of private farm access roads off the N2. These accesses are deemed suitable for the proposed adjusted land use but will require minor upgrades to accommodate the anticipated traffic. The construction phase of this development is estimated to generate ±18 peak hour trips, the operation and maintenance phase ± 56 peak hour trips, and the decommissioning phase ±15 peak hour trips. Overall, the traffic impacts of the proposed development are considered to be nominal. Several mitigation measures are proposed to accommodate the development and to reduce the impact to the surrounding road network.	will have a nominal impact on the existing traffic network. The project is therefore deemed acceptable from a transport perspective provided the recommendations and mitigations measures proposed herein are implemented, and hence the Environmental Authorisation (EA) should be granted.
Visual Impact Assessment	In terms of Landscape and Visual Impact Significance, the PV project is rated Medium without mitigation, and Medium to Low with mitigation or wind-blown dust, lights at night as well as soil erosion on the PV panels areas located on slope areas (less than 1 in 10m). In terms of negative cumulative effects, without mitigation the risk is rated High due to light spillage in the rural landscape from security lights at night. With mitigation and the careful management of security lighting and no overhead flood lights for the PV, BESS or substation areas, the risk can be reduced to Low. While both the Preferred and Alternative LILO/ BESS areas are suitable, there is a preference for the Preferred LILO area as the locality is less exposed to rural receptors. The following key reasons provide the motivation for the overall PV development: • The site visual resources are limited with a Medium rating for Scenic Quality and Low rating for Receptor Sensitivity to landscape change. • Regionally, the viewshed is contained to some degree from topographic screening and has no High or Medium Exposure Receptors. The nearest significant receptor area is the KNP located 12km to the north where massing effects of the combined views of the PV areas will not generate a dominating visual effect.	It is recommended that the proposed PV project should be authorised WITH Mitigation. With mitigation, the benefits of the PV related landscape change are likely to outweigh the landscape status quo, where scenic resources are limited.

Specialist Study	Findings	Recommendations
	• National energy objectives for renewable energy and job creation will be met and there is a good alignment with regional and local planning. • Medium rating for Visual Impact Significance with mitigation.	
Glint and Glare Impact Assessment	The impact of glare is assessed against ocular hazard protocols to determine whether such glare can be considered a nuisance or harmful to potential observers operating in, and around the solar PV facility. Several buildings and the natural environment surrounding the location of the proposed PV facility and several glare receptors, including route receptors such as nearby roads and railway lines, which lie within the viewshed of the proposed solar PV facility were considered in this assessment. Aviation receptors are excluded from this assessment due to none being in close proximity to the proposed solar PV facility. The potential impacts from the proposed solar PV facility from glint and glare are either none, or have a low impact (Green Glare). Green glare has a low intensity level and is similar to many materials such as concrete, steel sheeting and other building materials that have minimal visual impact. No negative impacts were observed from the site analysis. Due to low glare intensity observed during the analysis of the site, no negative impacts were identified and therefore no mitigation measures are required for the proposed solar PV modules. Using smooth glass solar PV modules without protective coatings will be suitable and not cause any harmful visual impact on surroundings.	Using smooth glass solar PV modules without an anti-reflective coating will result in either no glare, or green glare received at the assessed receptors. Green glare will not cause any harmful effect on nearby observers due to its low intensity and has a low potential for temporary after-image. As such, the proposed solar PV facility will not cause any significant, or harmful impact on nearby surroundings from a glint and glare perspective. SOLINK supports the findings of this report, as supplementary to the intended renewable energy project's Environmental Impact Assessment applications. It must be noted that although the intended solar PV project does not trigger any requirements for an aviation-related glint and glare assessment according to South African Civil Aviation Authority regulations, it would be advisable to contact Air Traffic Navigation Services (ATNS) to confirm in writing that Obstacle Registration with ATNS is not required due to their requirements (for glint and glare assessments, and obstacle registration) not being triggered: • The solar PV facility is not within 3 km of any aerodrome, airstrip, or helipad. • The solar PV facility does not lie within the extended 8 km, 9 degree diverted runway viewshed.

Specialist Study	Findings	Recommendations
Risk Assessment	This report summaries the high-level Safety Health and Environmental Risk Assessment conducted by ISHECON for the proposed Battery Energy Storage Systems at the proposed Roos SEF facilities. There will be a single BESS serving all four Solar PV facilities. The BESS storage capacity will be up to 500MW with up to four hours of storage i.e. up to 2000 megawatt-hour (MWh). Two alternative technologies are being considered for the BESS, i.e. either Solid State (typically Lithium chemistry) (SSL) or Redox Flow (typically vanadium chemistry) (VRFB). The technology is advancing rapidly and the exact technology and chemistry will be chosen during the Engineering, Procurement and Construction (EPC) phase. For SSL batteries this would mean multiple 125ontainerized units. For VRFB, the systems can be containerized but could, in order to achieve economies of scale, be one large utility scale plant within a conventional industrial type structural steel / brick warehousing structure. In either configuration there could be large volumes of electrolyte on site either in smaller tanks inside containers or larger tanks in a building. The VRFB facilities, either containerized or as utility buildings, will be bunded to contain 110% of the largest vessel. Supplementary infrastructure and equipment may include substations, power cables, transformers, power converters, substation buildings & offices, HV/MV switch gear, inverters and other control equipment that may be positioned within the battery containers / separate dedicated containers / the battery building. From a safety and health point of view, there are no significant cumulative impacts from any other BESS installation in the greater area.	• There are numerous different battery technologies but using one consistent battery technology system for the BESS installations associated with all the developments in the Belfast area associated with the Roos Project would allow for ease of training, maintenance, emergency response and could significantly reduce risks. • Where reasonably practicable, state-of-the-art battery technology should be used with all the necessary protective features e.g., draining of cells during shutdown and standby-mode, full BMS with deviation monitoring and trips, leak detection systems. • There are no fatal flaws associated with the proposed Solar Energy battery installation for either technology type. • The tables in Section 4 of the specialist report of this report contains technical and systems suggestions for managing and reducing risks. Ensure the items listed in these tables under preventative and mitigative measures are included in the design. • The overall design should be subject to a full Hazop prior to finalization of the design. • For the VRFB systems an end of life (and for possible periodic purging requirements) solution for the large quantities of hazardous electrolyte should be investigated, e.g., can it be returned to the supplier for re-conditioning. • Prior to bringing any solid-state battery containers into the country, the contractor should ensure that: o An Emergency Response Plan is in place that would be applicable for the full route from the ship to the site.

Specialist Study	Findings	Recommendations
		This plan would include details of the most appropriate emergency response to fires both while the units are in transit and once they are installed and operating. o An End-of-Life plan is in place for the handling, repurposing or disposal of dysfunctional, severely damaged batteries, modules and containers. • The site layout and spacing between lithium solid-state containers should be such that it mitigates the risk of a fire or explosion event spreading from one container to another. • In order to limit the possibility of domino failures the BESS should be separated from the substation by at least 20m. • Under certain weather conditions, the noxious smoke from a fire in a lithium battery container could travel some distance from the unit. The smoke will most likely be acrid and could cause irritation, coughing, distress etc. Close to the source of the smoke, the concentration of toxic gases may be high enough to cause irreversible harmful effects. Location of the facilities needs to ensure a suitable separation distance from public facilities/residences etc. The preferred and the alternative BESS locations are over 500m from isolated farmhouses/developments, and are therefore suitable in this context. • VRFB hazards are mostly related to possible loss of containment of electrolyte and solid-state systems may experience fires that may result in loss of containment of liquids or the use of large amounts of fire water which could be contaminated. One would not want these run-offs to enter water courses directly and

Specialist Study	Findings	Recommendations
		a BESS Location that is far from water courses would be preferred. The buffer distance between water bodies and the facilities containing chemicals should be set in consultation with a water specialist and is therefore not specified in this SHE RA. It is noted that there are no tributaries of the main water courses in the area within 100m of the proposed BESS Location. • Finally, it is suggested once the BESS technology has been chosen and more details of the final design are available, the necessary updated Risk Assessments should be in place (prior to commencement, after environmental authorisation and other necessary approvals are granted (should such be granted)).

SiVEST Environmental Division
12 Autumn Street, Rivonia, Sandton
2128. South Africa
PO Box2921, Rivonia,2128. South Africa

Tel + 27 11 798 0600
Fax +27 31 566 2371
Email info@sivest.com
www.sivest.com

Contact Person: Phumela Madubela
Tel No.: +27 11 798 0637
Email: phumelam@sivest.com