# DRAFT BASIC ASSESSMENT REPORT

Basic Assessment for the proposed development of the Padloper Solar PV Facility 1 (i.e., Padloper PV 1), the proposed development of a 132 kV Overhead Power Line between the Padloper PV 1 and the proposed authorised Ishwati Emoyeni Collector Substation (i.e., Padloper EGI 1), and their associated infrastructure, near Murraysburg in the Northern Cape and Western Cape Provinces

# APPENDIX H:

## Environmental Management Programme for the Solar Energy Facility

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# 1. INTRODUCTION

African Clean Energy Developments (Pty) Ltd (hereinafter referred to as the "Project Developer") is proposing, on behalf of Padloper PV (Pty) Ltd (hereinafter referred to as "the Project Applicant"), the development of seven solar photovoltaic (PV) facilities with a capacity of between 100 and 250 MW each, seven associated 132 kV overhead power lines, and their associated infrastructure, approximately 18 km north-east of the town of Murraysburg in the Western Cape and Northern Cape provinces (Figure 1).

The proposed cluster of Solar PV facilities, overhead power lines and their associated infrastructure are collectively referred to as the 'Padloper Solar and EGI Cluster'. The proposed cluster comprises of the following projects:

- PROJECT 1: Basic Assessment for the proposed development of the Padloper Solar PV Facility 1 and associated infrastructure (i.e., Padloper PV 1), near Murraysburg in the Northern Cape Province

- PROJECT 2: Basic Assessment for the proposed development of the Padloper Solar PV Facility 2 and associated infrastructure (i.e., Padloper PV 2), near Murraysburg in the Western Cape Province

- PROJECT 3: Basic Assessment for the proposed development of the Padloper Solar PV Facility 3 and associated infrastructure (i.e., Padloper PV 3), near Murraysburg in the Western Cape Province

- PROJECT 4: Basic Assessment for the proposed development of the Padloper Solar PV Facility 4 and associated infrastructure (i.e., Padloper PV 4), near Murraysburg in the Western Cape Province

- PROJECT 5: Basic Assessment for the proposed development of the Padloper Solar PV Facility 5 (i.e., Padloper PV 5), the proposed development of 132 kV Electrical Grid Infrastructure between the proposed Padloper PV 4 and the proposed Padloper PV 5 (i.e., Padloper EGI 5), and their associated infrastructure, near Murraysburg in the Western Cape Province

- PROJECT 6: Basic Assessment for the proposed development of the Padloper Solar PV Facility 6 (i.e., Padloper PV 6), the proposed development of 132 kV Electrical Grid Infrastructure between the proposed Padloper PV 4 and the proposed Padloper PV 6 (i.e., Padloper EGI 6), and their associated infrastructure, near Murraysburg in the Western Cape Province

- PROJECT 7: Basic Assessment for the proposed development of the Padloper Solar PV Facility PV 7 (i.e., Padloper PV 7), the proposed development of 132 kV Electrical Grid Infrastructure between the proposed Padloper PV 4 and the proposed Padloper PV 7

(i.e., Padloper EGI 7), and their associated infrastructure, near Murraysburg in the Western Cape Province

- PROJECT 8: Basic Assessment for the proposed development of a 132 kV Overhead Power Line and associated Electrical Grid Infrastructure between the proposed Padloper PV 1 and the proposed authorised Ishwati Emoyeni Collector Substation (i.e., Padloper EGI 1), near Murraysburg in the Northern Cape and Western Cape Provinces

- PROJECT 9: Basic Assessment for the proposed development of a 132 kV Overhead Power Line and associated Electrical Grid Infrastructure between the proposed Padloper PV 2 and the proposed authorised Ishwati Emoyeni Collector Substation (i.e., Padloper EGI 2), near Murraysburg in the Western Cape Province

- PROJECT 10: Basic Assessment for the proposed development of a 132 kV Overhead Power Line and associated Electrical Grid Infrastructure between the proposed Padloper PV 2 and the proposed Padloper PV 3 (i.e., Padloper EGI 3), near Murraysburg in the Western Cape Province

- PROJECT 11: Basic Assessment for the proposed development of a 132 kV Overhead Power Line and associated Electrical Grid Infrastructure between the proposed Padloper PV 4 and the proposed authorised Ishwati Emoyeni Collector Substation (i.e., Padloper EGI 4), near Murraysburg in the Northern Cape and Western Cape Provinces.

Project 1 is located in the Ubuntu Local Municipality and Pixley Ka Seme District Municipality in the Northern Cape, whilst Projects 2 to 7, 9, and 10 will be located in the Beaufort West Local Municipality and the Central Karoo District Municipality in the Western Cape. Projects 8 and 11 traverse both the specifically the Ubuntu Local Municipality and the Beaufort West Local Municipality in the Western Cape and Northern Cape.

**It is important to note that the above 11 Basic Assessment (BA) Processes are being undertaken separately, however the projects have been split into two batches. Batch 1 comprises of Projects 5 – 7. Batch 2 comprises of the BA Processes for Projects 1 - 4 and 8 – 11; these processes are currently being undertaken concurrently.[1] The BA Processes for the projects comprising Batch 1 were initiated in August 2023 and are being undertaken separately.**

This EMPr has been prepared as part of the requirements of the 2014 National Environmental Management Act (Act 107 of 1998, as amended) (NEMA) EIA Regulations (as amended). **This EMPr covers the proposed Padloper PV 1 (hereinafter referred to as Padloper Solar PV or the proposed project) only.** Figure 1 shows the overall locality of the proposed project.

[1] Approval to proceed with this phased release approach was granted during the pre-application meeting undertaken with the DFFE on 9 June 2023. Refer to Appendix G.3 of this BA Report for a copy of the approved minutes from the pre-application meeting.

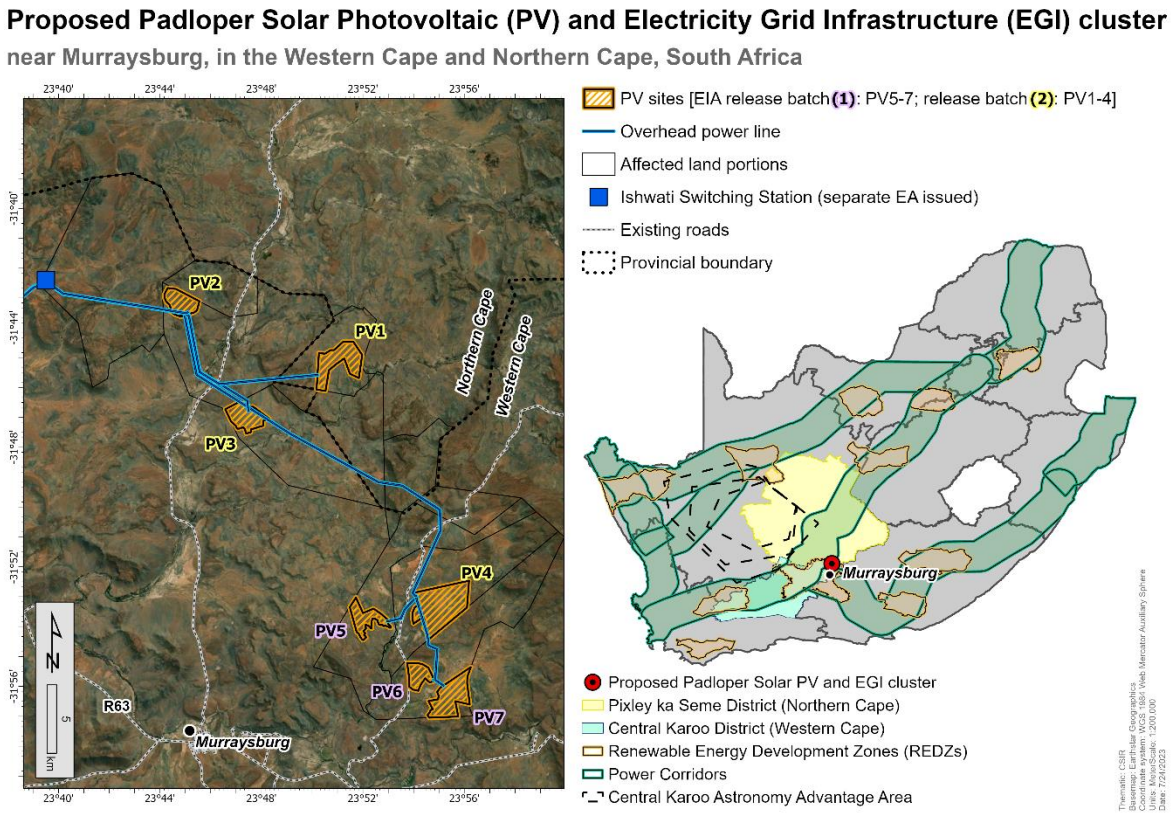


**Figure 1: Locality of the proposed Padloper Solar and EGI Cluster and the phased approach of the Basic Assessment Processes.[2]**

## 1.1 AUTHORS OF THE EMPr

This EMPr has been compiled by the Environmental Assessment Practitioner (Paul Lochner), the Project Manager (Dhiveshni Moodley), the Project Officers (Helen Antonopoulos and Phindile Mthembu), and the various specialists on the team (as indicated in Table 1). The details and expertise of the EAP and project team are provided in Appendix A of the BA Report; whilst those of the specialists are provided in Appendix D. 1 - 13. The Curriculum Vitae of the EAP and Project Manager are included in Appendix A of this EMPr.

**Paul Lochner (Registered EAP, Technical Advisor and Quality Assurance):**

Paul Lochner is an environmental assessment practitioner (EAP) at the CSIR, with more than 30 years of experience in a wide range of environmental assessment and management studies. Paul commenced work at CSIR in 1992, after completing a B.Sc. degree in Civil Engineering and

[2] Batch 1 comprises of PV and EGI 5-7 projects. Batch 2 comprises of the BA Processes for PV and EGI 1-4 projects; these processes are currently being undertaken concurrently.[2] The BA Processes for the projects comprising Batch 1 were initiated in August 2023 and are being undertaken separately.

a Masters in Environmental Science, both at the University of Cape Town. His initial work focused on wetlands and estuarine management; environmental engineering in the coastal zone; and coastal zone management plans. Since 2008, Paul has been the leader and manager of the Environmental Management Services (EMS) group within CSIR that has been at the forefront of advancing environmental assessment in South Africa. This group currently consists of 12 environmental scientists, planners, and engineers, with offices in Stellenbosch, Cape Town, and Durban. Paul's particular experience is in environmental planning and assessment for renewable energy, electricity grid infrastructure, desalination, oil and gas, wetlands and coastal zone management, and industrial and port development. He has been closely involved in the research and application of Strategic Environmental Assessment (SEA) in South Africa, and also has wide experience in Environmental and Social Impact Assessment, Environmental Management Programmes (EMPrs) and Environmental Screening Studies. He has been the project leader for over 40 SEAs and EIAs over the past 28 years. He also served as project leader for a suite of SEAs commissioned by the DFFE from 2014 to 2020. Paul is a Registered EAP (#2019/745) with the Environmental Assessment Practitioners Association of South Africa (EAPASA).

**Dhiveshni Moodley Cand. Sci. Nat. (Project Manager):**

Dhiveshni Moodley is environmental scientist at the CSIR. Dhiveshni holds a BSc, BSc Honours (cum laude) and MSc (cum laude) degrees in Environmental Science from the University of KwaZulu-Natal. She has more than three year's work experience in flood risk, hydropedological- and wetland functional assessment specialist studies, as well as conducting BAs and S&EIAs in the Renewable Energy sector. Her key interest lies in applying GIS analyses to aid the formation of accurate, feasible solutions to complex environmental challenges. Dhiveshni is registered as a Candidate Natural Scientist (#1472997/19) with the South African Council for Natural Scientific Professions (SACNASP).

**Table 1: Details of the BA Project Team**

| Name | Organisation | Role/ Specialist Study |
|---|---|---|
| **CSIR Project Team** | | |
| Paul Lochner (*Registered EAP (2019/745)*) | CSIR | EAP and Project Leader |
| Dhiveshni Moodley (*Cand.Sci.Nat.*) | CSIR | Project Manager |
| Helen Antonopoulos | CSIR | Project Officer |
| Luanita Snyman-van der Walt (*Pr.Sci.Nat.*) | CSIR | Project Mapping |
| Phindile Mthembu | CSIR | Project Officer |
| **Specialists** | | |
| Johann Lanz | Private | Agricultural Compliance Statement |
| Kerry Schwartz | SLR Consulting | Visual Impact Assessment |
| Jayson Orton | ASHA Consulting | Heritage Impact Assessment (Archaeology Cultural Landscape) |
| Elize Butler | Banzai Environmental | Palaeontology Impact Assessment |

| Name | Organisation | Role/ Specialist Study |
|---|---|---|
| Brian Colloty | Enviro-Sci | Terrestrial Biodiversity, Terrestrial Plant Species, and Terrestrial Animal Species |
| Brian Colloty | Enviro-Sci | Aquatic Biodiversity and Species Impact Assessment |
| Anja Albertyn | Holland & Associates Environmental Consultants | Avifauna Impact Assessment |
| Hugo van Zyl and James Kinghorn | Independent Economic Researchers | Socio-Economic Impact Assessment |
| Debbie Mitchell | Ishecon | BESS Risk Assessment (PV only) |
| Ntuthuko Hlanguza (*Pr Tech Eng*) | SiVEST | Traffic Impact Assessment |
| Hardy Luttig, Dale Barrow and Shane Teek | GEOSS South Africa (Pty) Ltd | Geohydrology Assessment |
| Hardy Luttig and Shane Teek | | Desktop Geotechnical Assessment |
| Lizande Kellerman, Dhiveshni Moodley, Heler Antonopoulos, Luanita Snyman-Van der Walt and Minnelise Levendal (ex CSIR employee) | CSIR | Civil Aviation Site Sensitivity Verification |
| Lizande Kellerman, Dhiveshni Moodley, Heler Antonopoulos, Luanita Snyman-Van der Walt and Minnelise Levendal (ex CSIR employee) | CSIR | Defence Site Sensitivity Verification |

## 1.2 PROJECT DESCRIPTION

The proposed projects will make use of PV technology to generate electricity from solar energy. Once a Power Purchase Agreement (PPA) is awarded, the proposed facility will generate electricity for a minimum period of 20 years. The construction phase for the proposed project is expected to be up to 24 months. The components of the proposed project are provided in Table 2 below.

It is important to note at the outset that the exact specifications of the proposed project components will be determined during the detailed engineering design phase (subsequent to the issuing of an EA, should such an authorisation be granted) but that the information provided below is seen as the maximum proposed development footprint for the proposed project.

**Table 2: Description of the Project Components for the proposed Padloper PV 1**

| Padloper PV 1 | | |
|---|---|---|
| **Infrastructure** | **Component** | **Dimensions / Specifications** |
| Solar PV | Type of technology | Solar Photovoltaic (PV) Technology |
| | Height of PV panels | Maximum of ± 4.5 m |
| | Capacity of the PV facility | Up to 250 MW |
| | Area of PV Array (i.e., proposed area occupied by PV Modules) | 420 ha<br><br>Note: The permanent fence line will run as close as possible to the solar array demarcation and substation area. Therefore, the PV array area and the total fenced area (i.e., the area that includes all associated infrastructure within the |

| Padloper PV 1 | | |
|---|---|---|
| **Infrastructure** | **Component** | **Dimensions / Specifications** |
| | | fenced off area of the PV facility) is anticipated to be similar. |
| | Technology mounting structure | The following technologies are being considered:<br>• Single Axis Tracking Structures (aligned north-south);<br>• Dual Axis Tracking (aligned east-west and north-south);<br>• Fixed Tilt Mounting Structures;<br>• Mono-facial Solar Modules; or<br>• Bifacial Solar Modules. |
| | Inverter-transformer stations | 3.5 MW inverters will be located across the proposed project. The exact number of inverters are still to be confirmed however all inverter-transformers will be within the PV array. |
| | Area occupied by inverter-transformer stations and height | Inverter-transformer stations: 0.022 ha each<br><br>The inverter stations will have a height of ± 3 m each.<br><br>Note: This is excluding lightning rods. The rods are expected to extend 10 m high. Each inverter station will have 1 – 2 lightning rods. |
| Overhead power line | Capacity | 132 kV |
| | Foundation | The size of the footprint area will range from 0.6 m x 0.6 m to 1.5 m x 1.5 m. The minimum working area required around a structure position is 20 m x 20 m. |
| | Pylon | Steel monopole or lattice towers |
| | Tower type | Self-supporting and Angle Strain towers |
| | Height | 17.4 m – 21 m |
| | Servitude length | Approximately 21 km |
| | Servitude width | The registered servitude will be up to 50 m wide.<br><br>Note that the entire servitude will not be cleared of vegetation. Vegetation clearance within the servitude will be undertaken in compliance with relevant standards and specifications.<br><br>A 400 m wide corridor (i.e., 200 m on either side of center line) was assessed by specialists, in order to identify sensitivities and features that need to be avoided. |
| | Proximity to grid connection | This proposed 132 kV overhead power line will facilitate the connection of the proposed Padloper PV facility to the existing Gamma Main |

| Padloper PV 1 | | |
|---|---|---|
| **Infrastructure** | **Component** | **Dimensions / Specifications** |
| | | Transmission Station (MTS), via the authorised Ishwati Emoyeni Collector Substation. |
| **Associated infrastructure** | | |
| Temporary construction and laydown area | Construction camp area (ha) | 1 - 4 ha<br><br>Note: These areas will be rehabilitated after construction and will not be retained for the operational phase. |
| Main access roads<br><br>Note: The existing road network will be used as far as practically possible and upgraded as needed. | Current width of access roads (m) | 5 m |
| | Length of access roads (km) | Approximately 10.2 km |
| Internal roads<br><br>Note: The existing road network will be used as far as practically possible and upgraded as needed. | Width of access roads (m) | 5 m |
| | Length of roads (km) | Approximately 12.91 km<br><br>The internal road network will be used to conduct security patrols and to access all the equipment (module cleaning and equipment maintenance). |
| Upgrading of existing access road/s<br><br>Note: Where required for turning circle/bypass areas, however, access or internal roads may be up to 10 m to allow for larger component transport. | Yes / No | Yes. Existing roads will be used as far as practically achievable. |
| | Current width (m) | ± 5 m |
| | Upgraded width (m) | ± 8 m (6 m wide road surface with 1 m drain either side) |
| Internal transmission and/or distribution lines | All on-site medium voltage cabling (22 or 33 kV) will be buried to a maximum depth of 1.5 m. | |
| Site offices Including a warehouse/workshop and an operational and maintenance (O&M) control centre. The details provided in this section is for one site office. | Number of buildings | Site offices and O&M control centre will be located in one building. The workshop and storage area may be attached to the O&M control centre. All buildings will be located within the O&M complex/footprint. |
| | Maximum height (m) | Up to 10 m |
| | Footprint ($m^2$) | 300 $m^2$ |
| Guard houses<br>Note: There will be 2 guardhouses at the proposed project site. The details provided in this section is for one guard house. | Maximum height (m) | Up to 3 m |
| | Footprint ($m^2$) | ± 6 m x 6 m<br>± 36 $m^2$ |

| Padloper PV 1 | | |
|---|---|---|
| **Infrastructure** | **Component** | **Dimensions / Specifications** |
| Ablution facilities<br>Note: There will be 2 ablution facilities proposed project site, included in site offices and guardhouse footprints. The details provided in this section is for one ablution facility. | Maximum height (m) | Up to 10 m |
| | Footprint ($m^2$) | Staff lockers: ± 22 m x 11 m<br>± 242 $m^2$ |
| Battery energy storage system (BESS) | Battery technology type | Lithium-ion, Sodium-ion, Solid State and Redox Flow technology types are being considered. |
| | Approx. footprint (ha) | ± 5 ha |
| | Maximum height (m) | Up to 10 m |
| | Capacity | 1 500 MWh |
| On-site substation | A 132 kV facility substation complex will be located within the site, and will cover an area of approximately 2 ha and will have a height of up to 18 m. | |
| On site medium voltage cables or cable trays | Maximum depth (m) | Up to 1.5 m |
| | Capacity | 22 or 33 kV |
| Water use requirements | Estimated quantity of water (litres) required for the construction phase | • Padloper PV 1: 50 000 $m^3$ per annum |
| | Estimated quantity of water (litres) required for the operational phase | • Padloper PV 1: 12 000 $m^3$ per annum |
| | Estimated quantity of water (litres) required for the decommissioning phase: | The exact amount of water required during this phase is unknown at this stage but expected to be similar to or less than that of the construction phase. |
| Construction period | | • Padloper PV 1: < 36 months |

Kindly note that the specifications of the associated 132 kV overhead power line have been included in the table to provide context. Refer to Appendix J for a copy of the EMPr for the overhead power line.

The proposed project can be divided into the following four main phases:

- Planning and Design Phase (Pre-construction Phase);
- Construction Phase;
- Operational Phase; and
- Decommissioning Phase.

Each activity undertaken as part of the above phases may have environmental impacts and, where applicable, has been assessed in the specialist studies (included in Appendix D of this BA Report). Management and mitigation measures required to address all the impacts are included within this EMPr.

The main activities that will form part of the construction phase are:

- Removal of vegetation for the proposed infrastructure, where necessary, within the approved development footprint to facilitate the construction and/or establishment of infrastructure. Note that vegetation is planned to be trimmed within the PV array area (and not removed completely);
- Excavations for infrastructure and associated infrastructure;
- Establishment of a laydown area for materials, equipment and plant;
- Establishment of parking areas, offices, workshop, waste area, hazardous materials store, access roads etc.;
- Erection of a perimeter security fence;
- Stockpiling of topsoil and cleared vegetation, where necessary (except for the PV array);
- Creation of employment opportunities;
- Transportation of material and equipment to site, and personnel to and from site;
- Construction of the solar fields and additional infrastructure; and
- Rehabilitation of areas disturbed by construction activities and landscaping.

The following activities will occur during the operational phase of the proposed project:

- The generation of electricity from the proposed solar facility; and
- Maintenance of the solar field and associated infrastructure (including vegetation).

At the end of the operational phase, the PV facility may be decommissioned, or may be repowered i.e. redesigned and refitted so as to operate for a longer period. The main aim of decommissioning is to return the land to its original, pre-construction condition. Should the unlikely need for decommissioning arise i.e. if the facility becomes outdated or the land needs to be used for other purposes, the decommissioning procedures will be undertaken in line with an approved EMPr and relevant legislation at the time, and the site will be rehabilitated and returned to its pre-construction state.

## 1.3 STRUCTURE OF THE EMPR AND DEFINITION OF STUDY AREA AND SITE

The following EMPrs have been compiled for the proposed project:

- **EMPr for the proposed solar PV facility and all associated infrastructure (i.e., this EMPr):**
    - This EMPr is included as Appendix H of this BA Report.
- **EMPr for the on-site substation complex to be located at the proposed project site:**
    - This EMPr is included in Appendix I of this BA Report, and it complies with the Generic EMPr published for substation development (Government Gazette 42323, GN 435, dated 22 March 2019).
- **EMPr for the facility switching station complex to be located at the proposed project site, adjacent to the on-site substation complex:**

  - This EMPr is included in Appendix K of this BA Report, and it complies with the Generic EMPr published for substation development (Government Gazette 42323, GN 435, dated 22 March 2019).
- **EMPr for the 132 kV overhead power line that will facilitate the connection of the proposed Padloper PV facility to the existing Gamma Main Transmission Station (MTS), via the authorised Ishwati Emoyeni Collector Substation:**
  - This EMPr is included in Appendix J of the BA Report, and it complies with the Generic EMPr published for power line development (Government Gazette 42323, GN 435, dated 22 March 2019).

The full extent of the affected farm properties on which the proposed PV facilities are planned to be constructed have been assessed by the specialists to identify environmental sensitivities and "no-go" areas. The farm portion/s associated with the proposed project are denoted in Table 3.

**Table 3: Farm portion associated with the proposed Padloper PV 1**

| Affected Farm Portion | Portion Number | SG Code |
|---|---|---|
| Portion 7 of Farm Klipplaat No. 109 | 7/109 | C06300000000010900007 |

In this EMPr, the following spatial parameters apply to the management actions, unless where specified differently, such as access roads:

- The total developable area is referred to as the area that includes all associated infrastructure within the fenced off area of the PV facility (i.e., 420 ha);
- The area of the PV array, which is the proposed area occupied by PV Modules (i.e., 420 ha); and
- The on-site substation hub comprising the facility substation, Battery Energy Storage System (BESS), and associated Operations and Maintenance (O&M) buildings (i.e., approximately 2 ha). Refer to Appendix I for a copy of the EMPr for the facility substation.

Where applicable, each section of the EMPr is divided into the following four phases of the project cycle:

- Planning and Design Phase (Pre-construction Phase);
- Construction Phase;
- Operational Phase; and
- Decommissioning Phase.

The EMPr includes the findings and recommendations of the BA Process and specialist studies. However, the EMPr is considered a "living" document and must be updated with additional information or actions during the design, construction, operational and decommissioning phases if applicable.

The EMPr follows an approach of identifying an over-arching goal and objectives, accompanied by management actions that are aimed at achieving these objectives (the outcomes). The management actions are presented in a table format in order to show the links between the goal and associated objectives, actions, responsibilities, and monitoring requirements and targets.

The management plans for the design, construction, operational and decommissioning phases consist of the following components:

- **Impact:** The potential positive or negative impact of the development that needs to be enhanced, mitigated, or eliminated.
- **Objectives/Outcomes:** The objectives necessary in order to meet the goal; these take into account the findings of the specialist studies.
- **Mitigation/Management Actions**: The actions needed to achieve the objectives/outcomes of enhancing positive benefits and mitigating or eliminating negative impacts; taking into consideration factors such as responsibility, methods, frequency, resources required and prioritisation.
- **Monitoring**: The key monitoring actions required to check whether the objectives/outcome are being achieved, taking into consideration methodology, frequency, and responsibility.

## 1.4 ENVIRONMENTAL SENSITIVITIES

Section C of the BA Report provides a detailed description of the environmental features and sensitive areas that were identified and assessed in detail by the specialists for consideration in the layout and location of the proposed project.

Based on the findings of the specialist studies, an environmental sensitivity map has been produced. This map shows the sensitivities on site (e.g., terrestrial, aquatic, avifaunal, visual, agricultural, and heritage features) within the larger assessed area that was identified. Based on this map, the preferred location for the proposed solar facility avoids the sensitive features that were identified by the specialists. Based on the boundaries of the assessed area and the constraints of the environmental sensitivities, a site layout has also been preliminarily determined for this project (Appendix F of this EMPr).

Appendix E of this EMPr includes the environmental sensitivity map for the study area which indicates the environmental sensitive areas and features identified during the BA Process (as described above). A combined project layout and sensitivity map is included in Appendix G of this EMPr.

## 1.5 IMPACTS IDENTIFIED DURING THE BA PROCESS

Based on the specialist studies (as shown in Table 2), the following main direct potential impacts, as indicated in Table 4, were identified and appropriate management and mitigation measures included within the EMPr (where required) to ensure the potential impacts are suitably addressed and managed during all phases of the project. Indirect and cumulative impacts are noted in Sections 4 to 10 of this EMPr, where relevant. It should be noted that other impacts for which specialist studies were not undertaken but where mitigation or management actions may be required, are also included in the EMPr.

**Table 4: Impacts identified in the BA Process**

| KEY IMPACT | IMPACTS IDENTIFIED |
|---|---|
| Agriculture | **Negative Impacts:**<br><br>**Construction Phase**<br>• Loss of agricultural potential by occupation of land.<br>• Loss of agricultural potential by soil degradation; and<br>• Loss of agricultural potential by dust generation.<br><br>**Decommissioning Phase**<br>• Loss of agricultural potential by soil degradation; and<br>• Loss of agricultural potential by dust generation.<br><br>**Positive Impacts:**<br><br>**Construction, Operational, and Decommissioning Phases**<br>• Increased financial security for farming operations; and |

| KEY IMPACT | IMPACTS IDENTIFIED |
|---|---|
| | • Improved security against stock theft and other crime due to the presence of security infrastructure and security personnel at the energy facility. |
| Visual | **Construction Phase**<br>• Large construction vehicles and equipment will alter the natural character of the study area and expose visual receptors to impacts associated with construction.<br>• Construction activities may be perceived as an unwelcome visual intrusion, particularly in more natural undisturbed settings.<br>• Dust emissions and dust plumes from increased traffic on the gravel roads serving the construction site may evoke negative sentiments from surrounding viewers.<br>• Surface disturbance during construction would expose bare soil (scarring) which could visually contrast with the surrounding environment.<br>• Temporary stockpiling of soil during construction may alter the flat landscape. Wind blowing over these disturbed areas could result in dust which would have a visual impact.<br>• Litter and construction waste on the construction site may result in visual pollution.<br>**Operational Phase**<br>• The PV arrays may be perceived as an unwelcome visual intrusion, particularly in more natural undisturbed settings.<br>• The proposed PV facility will alter the visual character of the surrounding area and expose potentially sensitive visual receptor locations to visual impacts.<br>• Glint and glare may impact nearby receptors.<br>• Dust emissions and dust plumes from maintenance vehicles accessing the site via gravel roads may evoke negative sentiments from surrounding viewers.<br>• The night-time visual environment will be altered as a result of operational and security lighting at the proposed PV facility.<br>**Decommissioning Phase**<br>• Vehicles and equipment required for decommissioning will alter the natural character of the study area and expose visual receptors to visual impacts.<br>• Decommissioning activities may be perceived as an unwelcome visual intrusion.<br>• Dust emissions and dust plumes from increased traffic on the gravel roads serving the decommissioning site may evoke negative sentiments from surrounding viewers.<br>• Surface disturbance during decommissioning would expose bare soil (scarring) which could visually contrast with the surrounding environment.<br>• Temporary stockpiling of soil during decommissioning may alter the flat landscape. Wind blowing over these disturbed areas could result in dust which would have a visual impact.<br>• Decommissioned infrastructure left on the site may be visually intrusive. |
| Heritage and Cultural Landscape | **Construction Phase**<br>• Damage or destruction of archaeological materials.<br>• Intrusion of solar facility and equipment into the landscape.<br>**Operational Phase**<br>• Intrusion of solar facility into the landscape.<br>**Decommissioning Phase**<br>• Intrusion of solar facility and equipment into the landscape. |

| KEY IMPACT | IMPACTS IDENTIFIED |
|---|---|
| Palaeontology | **Construction Phase**<br>• Loss of fossil heritage<br>• Disturbance/damage and destruction of fossils at /below surface.<br><br>**Operational Phase**<br>• No impact on fossil heritage<br><br>**Decommissioning**<br>• No impact on fossil heritage |
| Aquatic Biodiversity and Species | **Construction Phase**<br>• Loss of aquatic Species of Special Concern (SSC).<br>• Damage or loss of riparian and watercourse systems and disturbance of the waterbodies.<br>• Spills and leaks from construction vehicles / machinery when working in or near the delineated systems, impacting localised surface water quality.<br><br>**Operational Phase**<br>• Creation of hard surfaces, resulting in runoff, erosion and sedimentation.<br><br>**Decommissioning Phase**<br>• Damage or loss of riparian and watercourse systems and disturbance of the waterbodies.<br>• Spills and leaks from construction vehicles / machinery when working in or near the delineated systems, impacting localised surface water quality. |
| Terrestrial Biodiversity and Species | **Construction Phase**<br>• Loss of Species of Special Concern (SSC).<br>• Damage and disturbance of the habitats rated as Very High Sensitivity.<br>• Loss of ecosystem services, and or habitats that would result in habitat fragmentation, especially those included in any Biodiversity Conservation plans as Critical Biodiversity Areas (CBAs) or Ecological Support Areas (ESAs). This in turn could also lead to habitat fragmentation.<br>• Displacement of any animals because of any disturbance or habitat loss. This includes animal mortalities related to construction vehicular traffic.<br><br>**Operational and Maintenance Phase**<br>• Displacement of any animals which mostly includes animal mortalities related to vehicular traffic.<br><br>**Decommissioning Phase**<br>• Damage and disturbance of the habitats rated as Very High Sensitivity.<br>• Displacement of any animals because of any disturbance or habitat loss. This includes animal mortalities related to decommissioning vehicular traffic. |
| Avifauna | **Construction Phase**<br>• Disturbance and displacement of avifauna.<br>• Habitat loss and displacement.<br><br>**Operational Phase**<br>• Disturbance<br>• Collisions with PV Panels<br>• Electrocutions |

| KEY IMPACT | IMPACTS IDENTIFIED |
|---|---|
| | • Barrier effects<br><br>**Decommissioning Phase**<br>• Disturbance<br>• Habitat Loss |
| Socio-Economic | **Construction Phase**<br><br>• Impacts on regional employment and household income associated with project activities and expenditure.<br>• Impacts associated primarily with the influx of people including job seekers.<br>• Impacts on surrounding landowners and communities.<br>• Impacts on tourism.<br><br>**Operational Phase**<br><br>• Impacts on regional employment and household income associated with project activities and expenditure.<br>• Impacts associated with the funding of local socio-economic development, enterprise development and shareholding.<br>• Impacts associated primarily with the influx of people including job seekers.<br>• Impacts on surrounding landowners and communities.<br>• Impacts on tourism.<br><br>**Decommissioning Phase**<br><br>• Impacts on regional employment and household income associated with project activities and expenditure.<br>• Impacts associated primarily with the influx of people including job seekers.<br>• Impacts on surrounding landowners and communities.<br>• Impacts on tourism. |
| Geohydrology | **Construction Phase**<br><br>• Potential lowering of the groundwater level from construction requirements.<br>• Potential impact on groundwater quality as a result of accidental oil spillages or fuel leakages.<br><br>**Operational Phase**<br><br>• Potential lowering of the groundwater level from operational requirements.<br>• Potential impact of groundwater quality as a result of using cleaning agents for cleaning the solar.<br>• Potential Impact on Groundwater Quality as a result of accidental oil spillages or fuel leakages.<br><br>**Decommissioning Phase**<br><br>• Potential impact on groundwater quality as a result of accidental oil spillages or fuel leakages.<br>• Potential lowering of the groundwater level from decommissioning requirements. |

| KEY IMPACT | IMPACTS IDENTIFIED |
|---|---|
| Geotechnical | **Construction Phase**<br>• Removal of rocks and other geologic materials for site levelling and grading, resulting in loss of geologic materials, e.g. topsoil removal/loss, and potentially the destruction of habitats of endemic species.<br>• Contamination of geological materials as a consequence of the construction activities by earthworks machinery and other apparatus.<br>**Operational Phase**<br>• Increased unnatural hard surfaces yielding increased runoff, potentially increasing erosion.<br>• Contamination of geologic materials as a consequence of typical maintenance activities, as example, washing of solar panels, or spillages associated with battery energy storage facilities.<br>**Decommissioning Phase**<br>• Increased unnatural hard surfaces yielding increased runoff, potentially increasing erosion.<br>• Contamination of geologic materials as a consequence of the construction activities by earthworks machinery and other apparatus. |
| Traffic | **Construction**<br>• Increased abnormal load traffic.<br>• Increased normal load traffic (plant, equipment, materials, components, labour).<br>• Increase in incidents with pedestrians, livestock, plant and other vehicles.<br>• Increased need for road maintenance.<br>**Operational**<br>• Increase in abnormal load traffic.<br>• Increase in normal load traffic due to the transportation of staff, the delivery of replacement parts, repairs, and cleaning of panels.<br>• Increased need for road maintenance.<br>**Decommissioning Phases**<br>• Increase in abnormal load traffic.<br>• Increase in normal load traffic due to the delivery and removal of construction plant, equipment, materials, and solar PV facility components, and the transportation of labour.<br>• Increase in incidents with pedestrians, livestock, plant and other vehicles.<br>• Increased need for road maintenance. |
| BESS | Various risks were identified in terms of safety, health and the environment due to the proposed BESS. Refer to Appendix D of this EMPr for additional information regarding the risks as well as preventative and mitigation measures for all relevant phases. |

# 2. APPROACH TO PREPARING THE EMPr

## 2.1 COMPLIANCE WITH RELEVANT LEGISLATION

In terms of legal requirements, a crucial objective of the EMPr is to satisfy the requirements of Appendix 4 of the 2014 NEMA EIA Regulations (as amended), and Section 24N of the NEMA. These regulations regulate and prescribe the content of the EMPr and specify the type of supporting information that must accompany the submission of the report to the authorities. An overview of where the requirements are addressed in this EMPr is presented in Tables 5 and 6.

**Table 5: Compliance with Section 24N of NEMA**

| Requirements of Section 24N of NEMA | Where it is included in this EMPr |
|---|---|
| 2) The environmental management programme must contain-<br>a) information on any proposed management, mitigation, protection or remedial measures that will be undertaken to address the environmental impacts that have been identified in a report contemplated in subsection 24(1A), including environmental impacts or objectives in respect of:<br>(i) planning and design;<br>(ii) pre-construction and construction activities;<br>(iii) the operation or undertaking of the activity in question;<br>(iv) the rehabilitation of the environment; and<br>(v) closure, if applicable; | Columns detailing the impact description, mitigation and management objectives, and mitigation and management actions in Sections 4 to 10 of this EMPr. |
| b) details of-<br>(i) the person who prepared the environmental management programme; and<br>(ii) the expertise of that person to prepare an environmental management programme; | Section 1.1 and Appendix A of this EMPr. In addition, Appendix A of the BA Report. |
| c) a detailed description of the aspects of the activity that are covered by the environmental management programme; | Section 1 and Section 1.2 of this EMPr. |
| d) information identifying the persons who will be responsible for the implementation of the measures contemplated in paragraph (a); | Columns in Section 4 to 10 of the EMPr regarding the monitoring responsibility, including the requirements for monitoring and reporting on compliance and the responsible parties noted in Section 3. |
| e) information in respect of the mechanisms proposed for monitoring compliance with the environmental management programme and for reporting on the compliance; | The columns detailing the mitigation and management actions, and the monitoring methodology, frequency, and responsibility in Sections 4 to 10 of this EMPr. |
| f) as far as is reasonably practicable, measures to rehabilitate the environment affected by the undertaking of any listed activity or specified activity to its natural or predetermined state or to a land use which conforms to the generally accepted principle of sustainable development; and | Sections 4 to 10 of this EMPr, as applicable to the post-construction, rehabilitation phase and the decommissioning phase. |
| g) a description of the manner in which it intends to-<br>(i) modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation;<br>(ii) remedy the cause of pollution or degradation and migration of pollutants; and<br>(iii) comply with any prescribed environmental management standards or practices. | The columns detailing the mitigation and management objectives, mitigation and management actions, and the monitoring methodology, frequency, and responsibility in Sections 4 to 10 of this EMPr. |

| Requirements of Section 24N of NEMA | Where it is included in this EMPr |
|---|---|
| 3) The environmental management programme must, where appropriate-<br>a) set out time periods within which the measures contemplated in the environmental management programme must be implemented;<br>b) contain measures regulating responsibilities for any environmental damage, pollution, pumping and treatment of polluted or extraneous water or ecological degradation which may occur inside and outside the boundaries of the operations in question; and<br>c) develop an environmental awareness plan describing the manner in which-<br>(i) the applicant intends to inform his or her employees of any environmental risk which may result from their work; and<br>(ii) risks must be dealt with in order to avoid pollution or the degradation of the environment. | The columns detailing the mitigation and management actions, and the monitoring methodology, frequency, and responsibility in Sections 4 to 10 of this EMPr. Section 9 of this EMPr includes an Environmental Awareness Plan. |
| 5) The Minister, the Minister responsible for mineral resources or an MEC may call for additional information and may direct that the environmental management programme in question must be adjusted in such a way as the Minister, the Minister responsible for mineral resources or the MEC may require. | Not applicable at this stage. |
| 6) The Minister, the Minister responsible for mineral resources or an MEC may at any time after he or she has approved an application for an environmental authorisation approve an amended environmental management programme. | Not applicable at this stage. |
| 7) The holder and any person issued with an environmental authorisation-<br>a) must at all times give effect to the general objectives of integrated environmental management laid down in section 23;<br>b) must consider, investigate, assess and communicate the impact of his or her prospecting or mining on the environment;<br>c) must manage all environmental impacts<br>(i) in accordance with his or her approved environmental management programme, where appropriate; and<br>(ii) as an integral part of the prospecting or mining, exploration or production operation, unless the Minister responsible for mineral resources directs otherwise;<br>d) must monitor and audit compliance with the requirements of the environmental management programme;<br>e) must, as far as is reasonably practicable, rehabilitate the environment affected by the prospecting or mining operations to its natural or predetermined state or to a land use which conforms to the generally accepted principle of sustainable development; and<br>f) is responsible for any environmental damage, pollution, pumping and treatment of polluted or extraneous water or ecological degradation as a result of his or her operations to which such right, permit or environmental authorisation relates. | Throughout the EMPr |
| 8) Notwithstanding the Companies Act, 2008 (Act No. 71 of 2008), or the Close Corporations Act, 1984 (Act No. 69 of 1984), the directors of a company or members of a close corporation are jointly and severally liable for any negative impact on the environment, whether advertently or inadvertently caused by the company or close corporation which they represent, including damage, degradation, or pollution. | Section 3 and Appendix B of this EMPr details the responsibility of the Project Applicant. |

**Table 6: Compliance with Appendix 4 of the 2014 NEMA EIA Regulations (as amended)**

| Requirements of Appendix 4 of the 2014 NEMA EIA Regulations (as amended) | Where is it included in this EMPr? |
|---|---|
| 1. (1) An EMPr must comply with section 24N of the Act and include:<br>a) details of:<br>(i) the EAP who prepared the EMPr; and<br>(ii) the expertise of that EAP to prepare an EMPr, including a curriculum vitae; | Section 1.1 and Appendix A of this EMPr. Appendix A of the BA Report includes the Curriculum Vitae of the EAPs, and Appendix D includes the CVs of the specialists. |
| b) a detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description; | Section 1.2 of this EMPr |
| 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; | Appendix E, F and G of this EMPr |
| 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:<br>(i) planning and design;<br>(ii) pre-construction activities;<br>(iii) construction activities;<br>(iv) rehabilitation of the environment after construction and where applicable post closure; and<br>(v) where relevant, operation activities; | Columns detailing the impact description, mitigation and management objectives/outcomes, and mitigation and management actions in Sections 4 to 10 of this EMPr. |
| f) a description of proposed impact management actions, identifying the manner in which the impact management outcomes contemplated in paragraphs (d) will be achieved, and must, where applicable, include actions to:<br>(i) avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation;<br>(ii) comply with any prescribed environmental management standards or practices;<br>(iii) comply with any applicable provisions of the Act regarding closure, where applicable; and<br>(iv) comply with any provisions of the Act regarding financial provisions for rehabilitation, where applicable; | The columns detailing the mitigation and management actions in Sections 4 to 10 of this EMPr. The outlined management actions in this EMPr do not require any financial provisions for rehabilitation in terms of NEMA. |
| g) the method of monitoring the implementation of the impact management actions contemplated in paragraph (f); | The columns detailing the monitoring methodology in Sections 4 to 10 of this EMPr. |
| h) the frequency of monitoring the implementation of the impact management actions contemplated in paragraph (f); | The columns detailing the monitoring frequency in Sections 4 to 10 of this EMPr. |
| i) an indication of the persons who will be responsible for the implementation of the impact management actions; | The columns detailing the monitoring responsibility in Sections 4 to 10 of this EMPr. |
| j) the time periods within which the impact management actions contemplated in paragraph (f) must be implemented; | The columns detailing the mitigation and management actions, and the monitoring methodology and frequency in Sections 4 to 10 of this EMPr. |
| k) the mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f); | The columns detailing the mitigation and management actions, and the monitoring methodology, frequency, and responsibility in Sections 4 to 10 of this EMPr. |

| Requirements of Appendix 4 of the 2014 NEMA EIA Regulations (as amended) | Where is it included in this EMPr? |
|---|---|
| l) a program for reporting on compliance, taking into account the requirements as prescribed by the Regulations; | Sections 4 to 10 of the EMPr, including the requirements for monitoring and reporting on compliance and the responsible parties noted in Section 3 and Appendix B of this EMPr. |
| m) an environmental awareness plan describing the manner in which:<br>(i) the applicant intends to inform his or her employees of any environmental risk which may result from their work; and<br>(ii) risks must be dealt with in order to avoid pollution or the degradation of the environment; and | Section 9 of this EMPr. |
| n) any specific information that may be required by the competent authority. | Not applicable at this stage. |
| (2) Where a government notice *gazetted* by the Minister provides for a generic EMPr, such generic EMPr as indicated in such notice will apply. | Government Notice 435 includes a gazetted generic EMPr for power lines and substation infrastructure. Separate EMPrs have been compiled in order to comply with Government Notice 435 for the substation component of the proposed project. |

### 2.2 GOAL FOR ENVIRONMENTAL MANAGEMENT

The overall goal for environmental management for the proposed project is to plan, design, construct and operate the project in a manner that:

- Minimises the ecological footprint of the project on the local environment;
- Minimises impacts on fauna, flora and freshwater ecosystems;
- Facilitates harmonious co-existence between the project and other land uses in the area;
- Enhances the socio-economic benefits in the local area; and
- Contributes to the environmental baseline and understanding of environmental impacts of solar energy facility in a South African context.

## 3. ROLES AND RESPONSIBILITIES

Since the Generic EMPrs are applicable for the on-site substation complex, it is best to adopt the definitions of the roles and responsibilities as captured in the gazette Generic EMPr of GN 435. This will allow consistency of the management of the project from an environmental perspective and will avoid any contradiction in terms of the roles and responsibilities. The generic roles and responsibilities required for key role players are those of the:

- Project Developer / Developer's Project Manager (DPM);
- Developer Site Supervisor (DSS);
- Environmental Control Officer (ECO);
- Developer's Environmental Officer (DEO);
- Contractor; and
- Contractor's Environmental Officer (CEO).

The definitions of the roles and responsibilities are included in Appendix B of this EMPr. Note that the intent of Appendix B of this EMPr is to give a generic outline of what these roles typically require. It is expected that this will be appropriately defined at a later stage.

# 4. ALIEN INVASIVE VEGETATION MANAGEMENT PLAN

| Impact | Mitigation/ Management Outcomes | Mitigation/Management Actions | Monitoring | | |
|---|---|---|---|---|---|
| | | | Methodology | Frequency | Responsibility |
| **A. PLANNING AND DESIGN PHASE** | | | | | |
| 4.1. Impacts due to establishment of alien invasive plants as a result of the project. | Ensure the appropriate removal of alien invasive vegetation from the proposed project area and minimise the establishment and spread of alien invasive plants due to the project activities.<br><br>Avoid establishment and reduce the spread of alien invasive plants due to the project activities.<br><br>Limit the disturbance of aquatic habitats. | ▪ Compile a method statement that makes use of alien clearing and disposal methods as provided by the Working for Water Programme and outlined on the Department of Forestry, Fisheries and the Environment (DFFE) website[3]. The method statement should also take into account the relevant legislation under the National Environmental Management: Biodiversity Act (Act 10 of 2004) (NEM: BA)). | ▪ Ensure that legislation under NEM:BA is taken into consideration during the planning and design phase by reviewing signed minutes of meetings or signed method statement. | ▪ Once-off during the planning and design phase. | Project Developer<br>Contractor<br>ECO |
| **B. CONSTRUCTION PHASE** | | | | | |
| 4.2. Impacts due to the establishment of and increased spread of alien invasive plants as a result of the project. | Avoid establishment and reduce the spread of alien invasive plants due to the project activities. | ▪ Invasive alien plant growth should be monitored on an ongoing basis within the project site and immediate surrounds to ensure that the disturbed areas associated within project activities do not become infested with invasive alien plants.<br>▪ Implement an ongoing monitoring and control programme for alien invasive vegetation for | ▪ Ongoing monitoring of invasive alien plants within the site should be undertaken according to the approved method statement. Monitoring and control measures should take place at least biannually (every six months) for the construction phase.<br>▪ Herbicide and pesticide used as part of | As specified | Project Developer<br>ECO<br>Specialist<br>Contractor |

[3] https://www.dffe.gov.za/projectsprogrammes/wfw/resources#mannuals

| Impact | Mitigation/ Management Outcomes | Mitigation/Management Actions | Monitoring | | |
|---|---|---|---|---|---|
| | | | Methodology | Frequency | Responsibility |
| | | the construction phase to detect and quantify any alien invasive species that may become established within the construction site. | control measures should be approved by the ECO prior to application, taking all sensitive features into account. | | |
| | | ▪ Ensure proper management of soil stockpiles. Do not import soil stockpiles from areas with alien plants to ensure proper management of stockpiles. | ▪ Monitor the presence of alien invasive plants during the construction phase via visual inspections and take action to remove and control these species. | On-going | ECO<br>Contractor |
| | | ▪ Undertake rehabilitation of disturbed areas as soon as possible after construction. Stockpile the shallow topsoil layer separately from the subsoil layers. Reinstate the topsoil layers (containing seed and vegetative material) when construction is complete to allow the plants to rapidly re-colonise the bare soil areas. | ▪ Rehabilitate disturbed areas and monitor the presence of alien invasive species on site. | On-going | ECO<br>Contractor |
| | | ▪ Keep clearance and disturbance of indigenous vegetation to a minimum. | ▪ Monitor and manage vegetation clearing by undertaking visual inspections to ensure minimal disturbance and to restrict activities to the demarcated project footprint. | On-going | ECO<br>Contractor |
| | | ▪ Ensure that the footprint required for the proposed project activities (such as temporary stockpiling, earthworks, storage areas, site establishment etc.) is clearly demarcated and kept at a minimum. | ▪ Verify that the proposed project area is determined and demarcated prior to the commencement of the construction phase by undertaking visual inspections. | Once-off prior to construction and as required during the construction process. | ECO<br>Contractor |
| | | ▪ The removed alien invasive vegetation should be immediately disposed at a suitable waste disposal facility and should not be kept on site for prolonged periods of time, as this will enhance the spread of these species. Should vegetation need to be stored for short periods of time (hours/ few days) prior to disposal this should be in a container with a lid/ cover. Transportation should be in a sealed container/ bags and in a covered vehicle. | ▪ Monitor the removal, temporary storage, transportation and disposal of the alien vegetation found on site via visual inspections. | As necessary during the construction phase. | ECO |

| Impact | Mitigation/ Management Outcomes | Mitigation/Management Actions | Monitoring | | |
|---|---|---|---|---|---|
| | | | Methodology | Frequency | Responsibility |
| | | ▪ All construction machinery and plant equipment delivered to site for use during the construction phase should be cleaned in order to limit the introduction of alien species.<br>▪ Construction materials brought onto the site should be free of alien plant seed. Sources of alien seed should be prevented from being brought onto the site with imported materials. | ▪ Clean machinery and equipment prior to the construction phase.<br>▪ ECO to conduct visual inspections to verify that machinery and equipment are cleaned, and that materials brought to site are free of alien plant seed and report any non-compliance. | Prior to the commencement of construction.<br>As necessary during the construction phase. | ECO<br>Contractor |
| **C. OPERATIONAL PHASE** | | | | | |
| 4.3. Impacts due to establishment of alien invasive plants. Exotic weed invasion may result in the ousting of natural vegetation and alteration of ecological processes on site, with incremental impacts on the adjacent veld types. | Reduce the establishment and spread of alien invasive plants.<br><br>To remove exotic weeds as and when they may arise and thereby prevent alteration of local and adjacent habitat forms.<br><br>Control of invasive alien plants in riparian zones and wetland areas.<br><br>Avoid establishment and reduce the spread of alien invasive plants due to the project activities. | ▪ Implement an ongoing monitoring programme for alien invasive vegetation for the operational phase to detect and quantify any alien invasive species that may become established within the operational site.<br>▪ Invasive alien plant growth and signs of erosion should be monitored on an ongoing basis to ensure that the disturbed areas do not become infested with invasive alien plants. Ongoing control of invasive alien plants within the site should be undertaken.<br>▪ Invasive alien plant material that has been cleared should be removed from the riparian zones and not left on the river banks or burnt within the riparian zone and buffer area.<br>▪ The removed alien invasive vegetation should be immediately disposed at a suitable waste disposal facility and should not be kept on site for prolonged periods of time, as this will enhance the spread of these species. Should vegetation need to be stored for short periods of time (hours/ few days) prior to disposal this should be in a container with a lid/ cover. Transportation should be in sealed containers/ bags and in a covered vehicle. | ▪ Ongoing monitoring of invasive alien plants within the site should be undertaken according to the approved method statement. Monitoring and control measures should take place at least biannually (every six months) for the first 3 years of the project and should be adjusted as required based on the first 3 years results / success rate.<br>▪ Herbicide and pesticide used as part of control measures should be approved by the ECO prior to application, taking all sensitive features into account.<br>▪ Monitor the removal, temporary storage, transportation and disposal of the alien vegetation found on site via visual inspections. | As specified<br>As required during the operational phase<br>As required during the operational phase | Environmental Manager<br>ECO<br>Contractor |

| Impact | Mitigation/ Management Outcomes | Mitigation/Management Actions | Monitoring | | |
|---|---|---|---|---|---|
| | | | Methodology | Frequency | Responsibility |
| **D. DECOMMISSIONING PHASE** | | | | | |
| 4.4. Exotic weed invasion of the decommissioned site resulting in ecological change. | Avoid establishment and reduce the spread of alien invasive plants due to the project activities. | ▪ Implement an ongoing monitoring programme for alien invasive vegetation for the decommissioning phase to detect and quantify any alien invasive species that may become established within the decommissioning site.<br>▪ Control of invasive alien plants within the site should be undertaken according to the approved method statement.<br>▪ Mitigation and follow-up monitoring of residual impacts (alien vegetation growth and erosion) may be required. | ▪ Ongoing monitoring of invasive alien plants within the site should be undertaken according to an approved method statement.<br>▪ After all infrastructure is removed, a final site inspection should be done, and all remaining plants must be cleared.<br>▪ Herbicide and pesticide used as part of control measures should be approved by the ECO prior to application, taking all sensitive features into account. | As required during decommissioning | Contractor<br>ECO<br>Project Developer |
| | | ▪ All natural areas must be rehabilitated with species indigenous to the local area. Re-seed with locally sourced seed of indigenous grass species that were recorded on site pre-construction. | ▪ Final external audit of area to confirm that area is rehabilitated to an acceptable level. | Once off | Contractor with advice from specialist |

# 5. STORM WATER MANAGEMENT PLAN

| Impact | Mitigation/Management Outcomes | Mitigation/Management Actions | Monitoring | | |
|---|---|---|---|---|---|
| | | | Methodology | Frequency | Responsibility |
| **A. PLANNING AND DESIGN PHASE** | | | | | |
| 6.1. Impact of the project if a detailed storm water management plan is not correctly prepared. | To limit the effect of uncontrolled storm water run-off from developed areas onto natural areas | ▪ Prepare a detailed stormwater management plan (SWMP) outlining appropriate treatment measures to address runoff from disturbed portions of the site. | ▪ Check compliance with specified conditions.<br>▪ Ensure that this is taken into consideration during the planning and design phase by reviewing signed minutes of meetings or signed reports. | Once-off during design followed by regular control<br>During the planning and design phase | Contractor<br>ECO |
| **B. CONSTRUCTION PHASE** | | | | | |
| 6.2. Diversion and impedance of surface water flows – Changes to the hydrological regime and increased potential for erosion.<br><br>Diversion and increased velocity of surface water flows – reduction in permeable surfaces | Prevent interference with natural run-off patterns, diverting flows and increasing the velocity of surface water flows. | ▪ The appointed Contractor should compile a Method Statement for Stormwater Management during the construction phase. | ▪ Compile a Method Statement for stormwater management during the construction phase.<br>▪ Inspect and verify if a Method Statement for stormwater management has been compiled by the Contractor via audits prior to the commencement of the construction phase. | Prior to the construction phase.<br>Once-off prior to the commencement of the construction phase. | Contractor<br>ECO |
| | | ▪ Erosion and sedimentation into water bodies must be minimised through the effective stabilisation (gabions and Reno mattresses or similar) and the re-vegetation of any disturbed riverbanks. | ▪ Check compliance with specified conditions of the Stormwater Management Plan (SWMP) and Method Statement. | Weekly or Bi-weekly | ECO |
| | | ▪ Reinforce soil slopes to minimise erosion during rehabilitation (as needed, and once construction in a specific area has ceased). | ▪ Monitor activities and record and report non-compliance. | As needed during the construction phase | ECO |
| | | ▪ Any irrigation of the development area for landscaping or dust control purposes should be controlled, such that it does not result in any measurable increase in moisture being passed into natural drainage lines. | ▪ Check compliance with specified conditions of the Stormwater Management Plan and Method Statement. | Weekly or bi-weekly | ECO |

| Impact | Mitigation/Management Outcomes | Mitigation/Management Actions | Monitoring | | |
|---|---|---|---|---|---|
| | | | Methodology | Frequency | Responsibility |
| | | ▪ Drainage along the sides of the roads should be designed so that it does not result in concentrated flows into watercourses. | ▪ Check compliance with specified conditions of the SWMP and Method Statement. | Weekly or bi-weekly | ECO |
| | | ▪ Perform periodic inspections and maintenance of soil erosion measures and stormwater control structures. | ▪ Monitor activities and record and report non-compliance. | As needed during the construction phase | ECO |
| 6.3. Pollution of the surrounding environment as a result of the contamination of stormwater. Contamination could result from the spillage of chemicals, oils, fuels, sewage, solid waste, litter etc. | To prevent contaminated stormwater from entering into and adversely impacting on freshwater ecosystems and reducing the water quality.<br><br>To reduce sedimentation of nearby water systems.<br><br>To apply best practice principles in managing risks to storm water pollution. | ▪ The appointed Contractor should compile a Method Statement for Stormwater Management during the construction phase. | ▪ Compile a Method Statement for stormwater management during the construction phase.<br>▪ Inspect and verify if a Method Statement for Stormwater Management has been compiled by the Contractor via audits prior to the commencement of the construction phase. | Prior to the construction phase.<br>Once-off prior to the commencement of the construction phase. | Contractor<br>ECO |
| | | ▪ Provide secure storage for fuel, oil, chemicals, and other waste materials to prevent contamination of stormwater runoff. Fuels and chemicals (i.e., any hazardous materials and dangerous goods) used during the construction phase must be stored safely on site and in bunded areas. Fuel and chemical storage containers must be inspected to ensure that any leaks are detected early. | ▪ Monitor the storage and handling of dangerous goods and hazardous materials on site via site audits and record non-compliance and incidents. Monitor if spillages have taken place and if they are removed correctly. | Weekly | ECO |
| | | ▪ All stockpiles must be protected from erosion and stored on flat areas where run-off will be minimised. Erosion and sedimentation into water bodies must be minimised through effective stabilisation. No stockpiling should take place within a watercourse.<br>▪ Stockpiles must be located away from river channels i.e., greater than 32 m. | ▪ Monitor the excavations and stockpiling process throughout the construction phase via visual site inspections. Record non-compliance and incidents. | Daily | ECO |
| | | ▪ Littering and contamination of water resources during construction must be prevented by effective construction camp management. | ▪ Monitor via site audits and record non-compliance and incidents (i.e., by implementing walk through inspections). | Weekly | Contractor<br>ECO |
| | | ▪ Emergency plans must be in place to deal with | ▪ Check compliance with specified | Weekly or Bi-weekly | ECO |

| Impact | Mitigation/Management Outcomes | Mitigation/Management Actions | Monitoring | | |
|---|---|---|---|---|---|
| | | | Methodology | Frequency | Responsibility |
| | | potential spillages (especially those leading to any watercourses). | conditions of the SWMP and Method Statement. | | |
| | | ▪ Erosion and sedimentation into water bodies must be minimised through the effective stabilisation (gabions and Reno mattresses or similar) and the re-vegetation of any disturbed riverbanks, as applicable. | ▪ Check compliance with specified conditions of the SWMP and Method Statement. | Weekly or Bi-weekly | ECO |
| | | ▪ Ensure that the temporary site camp and ablution facilities are established at least 32 m away from the banks of the major drainage lines. The sensitivities captured in the sensitivity map included in Appendix E of this EMPr must also be considered when placing the site camp (the buffers assigned to water courses should also be avoided, where possible in this regard). | ▪ Monitor the placement of the site camp via visual inspections, and record and report any non-compliance. | Once-off prior to construction and as required during the construction phase. | ECO |
| | | ▪ Ensure that there is no ad-hoc and indiscriminate crossing of watercourses and channels by vehicles during the construction phase. Access routes across the site should be strictly demarcated and selected with a view to minimise impacts on drainage lines. Watercourses where no construction activities are proposed must be considered as no-go areas. | ▪ Check compliance with specified conditions of the SWMP and Method Statement. | Weekly or Bi-weekly | ECO |
| | | ▪ Ensure that no waste materials or sediments are left in the surrounding drainage lines (as a result of the construction). | ▪ Check compliance with specified conditions of the SWMP and Method Statement. | Weekly or Bi-weekly | ECO |
| | | ▪ Regular inspections of stormwater infrastructure should be undertaken to ensure that it is kept clear of all debris and weeds. | ▪ Monitor via site audits and record non-compliance and incidents (i.e., by implementing walk through inspections). | Weekly | Contractor<br>ECO |
| **C. OPERATIONAL PHASE** | | | | | |
| 6.4. Stormwater discharge into the surrounding | To minimise the contamination of stormwater by uncontrolled release of contaminated or grey | ▪ An operational phase SWMP should be designed and implemented, with a view to prevent the passage of concentrated flows from hardened | ▪ Compile a SWMP for the operational phase.<br>▪ Inspect and verify if a SWMP has | Continuously during operational phase.<br>Once-off prior to the | Project Developer |

| Impact | Mitigation/Management Outcomes | Mitigation/Management Actions | Monitoring | | |
|---|---|---|---|---|---|
| | | | Methodology | Frequency | Responsibility |
| environment during operations | water.<br><br>To protect soil resources and prevent soil erosion. | surfaces and onto natural areas. | been compiled prior to the commencement of the operational phase. | commencement of the operational phase. | |
| | | ▪ All release points into the natural environment must have appropriate energy dissipaters to minimise scouring/ erosion. | ▪ Monitor activities and record and report non-compliance.<br>▪ Monitor the placement of energy dissipaters via visual inspections, and record and report any non-compliance. | On-going | Project Developer |
| | | ▪ As far as reasonably possible, separate "clean" and "dirty" storm water. As far as reasonably possible, capture and contain "dirty" stormwater for appropriate disposal/discharge. | ▪ Monitor via site audits and record non-compliance and incidents (i.e., by implementing inspections). | Weekly or as required during operations. | Project Developer |
| | | ▪ Regular inspections of stormwater infrastructure should be undertaken to ensure that it is kept clear of all debris and weeds. | ▪ Undertake regular inspections of the stormwater infrastructure (i.e., by implementing walk through inspections). | Weekly/Monthly | Project Developer |
| 6.5 Creation of hard surfaces resulting in runoff, erosion and sedimentation | Management stormwater on site to minimise erosion and sedimentation | ▪ Monitoring should occur on a monthly basis for 6 months post construction and where any unstable soils occur, these must be protected with temporary stabilisation dependent on the scale of the impact i.e., sandbags - hay bales) until areas become revegetated. If any areas require permanent erosion protection (e.g., gabions or stone pitching) then this must be included in the GA application. | ▪ Undertake audits following the construction phase and report any non-compliance. | Monthly, especially during periods of high precipitation | Project Developer ECO |
| **D. DECOMMISSIONING PHASE** | | | | | |
| 6.5. The proposed solar facility would be expected to run for a minimum period of 20 years, after which it would either be decommissioned, alternatively upgraded or an application submitted to obtain a new license. Should the plant be decommissioned, the solar field would be rehabilitated to its original (pre-development) state. In the (unlikely) event that none of the mitigation measures outlined for the construction and operational phases of the proposed project had been implemented, the period of time for recovery to take place would be extended. In the event that decommissioning occurs, and assuming implementation of mitigation measures, the hydrological regime should fully recover over time to present day conditions. | | | | | |

# 6. TRAFFIC MANAGEMENT PLAN INCLUDING TRANSPORTATION PLAN

| Impact | Mitigation/ Management Outcomes | Mitigation/Management Actions | Monitoring | | |
|---|---|---|---|---|---|
| | | | Methodology | Frequency | Responsibility |
| **A. PLANNING AND DESIGN PHASE** | | | | | |
| 5.1. Increased traffic generation | Manage impact that additional traffic generation will have on road network | ▪ If abnormal loads need to be transported by road to the site, a permit will need to be applied for in terms of Section 81 of the National Road Traffic Act and authorisation needs to be obtained from the relevant road authorities to modify the road reserve to accommodate turning movements at intersections (if necessary).<br>▪ It is anticipated that a few sections of the DR2404 may require widening from approximately 4 m to 6 m to accommodate the turning movements of the abnormal load vehicles. | ▪ Ensure that the permits are applied for and obtained prior to commencement.<br>▪ Verify that this has been undertaken by reviewing approved permits. | Once-off | Contractor<br>ECO |
| | | ▪ Provincial Roads' public accessibility must be retained (if not closed/ de-proclaimed to become private or servitude roads) and they must be evaluated for the purposes of construction, operation, and decommissioning. | ▪ Ensure that this is taken into consideration during the planning and design phase by reviewing signed minutes of meetings or signed reports. | Once-off | Project Developer<br>ECO<br>Traffic Specialist |
| | | ▪ The route to the sites should be further investigated prior to construction to ensure that:<br>- assess the condition of the current access roads to and within the sites;<br>- ensure that access roads avoid any sensitive biophysical or heritage features;<br>- assess that abnormal loads are not obstructed at any point during the transportation process by geometric, height and width limitations along the route. | ▪ Ensure that this is taken into consideration during the planning and design phase by reviewing signed minutes of meetings or signed reports. | Once-off | Project Developer<br>Traffic Specialist |
| | | ▪ Discussions must be held with the relevant landowners on which the internal access farm road leading to the sites is located, prior to commencement to confirm requirements and details of the agreement. | ▪ Ensure that this is taken into consideration during the planning and design phase by reviewing signed minutes of meetings or signed reports. | Once-off | Project Developer<br>ECO |

| Impact | Mitigation/ Management Outcomes | Mitigation/Management Actions | Monitoring | | |
|---|---|---|---|---|---|
| | | | Methodology | Frequency | Responsibility |
| | | ▪ Ensure that the requirements for use of the internal farm access roads leading to the sites are addressed and considered in the design, as and where applicable. | ▪ Ensure that this is taken into consideration during the planning and design phase by reviewing signed minutes of meetings or signed reports. | Once-off | Project Developer<br>ECO |
| | | ▪ Provide a Transport Traffic Plan to the Provincial and Municipal Road Department (if required). | ▪ Ensure that the plan is compiled and submitted prior to commencement.<br>▪ Verify that this has been undertaken by reviewing approved plans. | Once-off | Contractor<br>ECO<br>Traffic Specialist |
| | | ▪ Continuous engagement with the Northern Cape Department of Roads and Public Works. | ▪ Programming and road construction | Quarterly | Contractor<br>Project Developer<br>ECO |
| 5.2. Accelerated degradation of road structure due to construction, operational and decommissioning phase traffic. | Limit the deterioration of the road condition due to construction, operational and decommissioning phase traffic. | ▪ A Road Maintenance Plan should be developed for the internal farm access roads (i.e., internal private roads leading off the DR2404) that will be used. The plan should address requirements such as, but not limited to, grading, dust suppressant mechanisms, drainage (where required), signage, and speed limits. The Road Maintenance Plan must ensure regular maintenance of the roads. The Road Maintenance Plan must be communicated with the relevant authorities, where required, and must be provided to the surrounding community forum prior to commencement of construction.<br>▪ A geotechnical and geometric design report, including improvement proposals, must be compiled to ensure that all the roads that will be affected by these developments during the construction phase are adequately improved and maintained before any other construction activity may commence on any of the farm portions. Note that any design affecting any Proclaimed Provincial Road must carry the approval of the Chief Directorate (Road Design) of the Northern Cape Department of Roads and Public Works. | ▪ Ensure that the Road Maintenance Plan is compiled and submitted prior to commencement.<br>▪ Verify that this has been undertaken by reviewing approved plans.<br>▪ Ensure that the geotechnical and geometric design report is compiled and approved prior to commencement.<br>▪ Verify that the report has been undertaken by reviewing approved plans. | Once-off | Project Developer<br>Traffic Specialist<br>Contractor<br>ECO |

| Impact | Mitigation/ Management Outcomes | Mitigation/Management Actions | Monitoring | | |
|---|---|---|---|---|---|
| | | | Methodology | Frequency | Responsibility |
| **B. CONSTRUCTION PHASE** | | | | | |
| 5.3. Increased abnormal load traffic | Reduce significance of abnormal load traffic | ▪ Schedule abnormal load traffic in off-peak periods. | ▪ Logistics planning and scheduling | Monthly | Contractor |
| | | ▪ It is recommended that traffic be controlled during construction, and that adequate signage be erected, at pre-identified narrow bridges along Road MR607. | ▪ Signpost construction | Once-off | Contractor |
| | | ▪ Stagger delivery of abnormal loads. | ▪ Programming of construction activities | Monthly | Contractor |
| | | ▪ Adhere to traffic laws and permit conditions relating to the transportation of abnormal loads. | ▪ Training and monitoring | Monthly | Contractor<br>ECO |
| 5.4. Increased normal load traffic | Reduce normal load traffic | ▪ Stagger delivery of plant, equipment, materials and components. | ▪ Programming of construction activities | Monthly | Contractor |
| | | ▪ Construct an on-site concrete batching plant. | ▪ Construction | Once-off | Contractor<br>ECO |
| | | ▪ Transport staff in off-peak periods and by bus or minibus. | ▪ Logistics planning and scheduling | Monthly | Contractor |
| 5.5. Increased incidents with pedestrians and livestock | Avoid incidents with pedestrians and livestock | ▪ Maintenance of farm fences | ▪ Fence construction and repair | Monthly | Property owners |
| | | ▪ Erect road signage informing motorists of property accesses and designated animal road crossings. | ▪ Signpost construction | Once-off | Contractor |
| | | ▪ Maintain road verges along local and access roads to provide safe walking space for pedestrians. | ▪ Bush clearing and grass cutting | Bi-monthly | Contractor |
| 5.6. Increased need for road maintenance | Reduce/address deterioration of local roads | ▪ Reduce speed of vehicles in the vicinity of construction. | ▪ Erection of construction warning signs; training and evaluation of drivers and operators | Monthly | Contractor<br>Project Developer<br>ECO |
| | | ▪ Construct gravel access and internal roads according to TRH20 – Unsealed Roads: Design Construction and Maintenance. | ▪ Road construction | Once-off | Contractor<br>Project Developer<br>ECO |
| | | ▪ Avoid use of gravel roads in wet weather. | ▪ Programming of construction activities | During rain | Contractor<br>Project Developer<br>ECO |
| | | ▪ Appropriate, timely and high-quality maintenance of gravel roads. | ▪ Road construction | As required | Contractor<br>Project Developer<br>ECO |
| | | ▪ Implement a road maintenance programme under the auspices of the respective transport | ▪ Programming and road construction | Quarterly | Contractor<br>Project Developer |

| Impact | Mitigation/ Management Outcomes | Mitigation/Management Actions | Monitoring | | |
|---|---|---|---|---|---|
| | | | Methodology | Frequency | Responsibility |
| | | department(s). | | | ECO |
| | | ▪ Continuous engagement with the NCDRPW and WCDTPW. | ▪ Programming and road construction | Quarterly | Contractor<br>Project Developer<br>ECO |
| **C. OPERATIONAL PHASE** | | | | | |
| 5.7. Increased abnormal load traffic | The increase in traffic for this phase of the development is negligible and will not have a significant impact. | ▪ No mitigation measures are proposed. | ▪ N/A | N/A | N/A |
| 5.8. Increased normal load traffic | The increase in traffic for this phase of the development is negligible and will not have a significant impact. | ▪ No mitigation measures are proposed. | ▪ N/A | N/A | N/A |
| 5.9. Increased need for road maintenance | Reduce/address deterioration of local roads | ▪ Reduce speed of vehicles in the vicinity of construction | ▪ Erection of construction warning signs; training and evaluation of drivers and operators | Monthly | Project Developer |
| | | ▪ Appropriate, timely and high-quality maintenance of gravel roads. | ▪ Road construction | As required | Contractor<br>Project Developer<br>ECO |
| | | ▪ Implement a road maintenance programme under the auspices of the respective transport department(s). | ▪ Programming and road construction | Quarterly | Project Developer |
| | | ▪ Continuous engagement with the NCDRPW and WCDTPW. | ▪ Programming and road construction | Quarterly | Contractor<br>Project Developer<br>ECO |
| **D. DECOMMISSIONING PHASE** | | | | | |
| 5.10. Increased abnormal load traffic | Reduce significance of abnormal load traffic | ▪ Schedule abnormal load traffic in off-peak periods. | ▪ Logistics planning and scheduling | Monthly | Contractor |
| | | ▪ Stagger delivery of abnormal loads. | ▪ Programming of construction activities | Monthly | Contractor |
| | | ▪ Adhere to traffic laws and permit conditions relating to the transportation of abnormal loads. | ▪ Training and monitoring | Monthly | Contractor<br>ECO |
| 5.11. Increased normal load traffic | Reduce normal load traffic | ▪ Stagger delivery/removal of plant, equipment, materials and components | ▪ Programming of construction activities | Monthly | Contractor |
| | | ▪ Transport staff in off-peak periods and by bus or | ▪ Logistics planning and scheduling | Monthly | Contractor |

| Impact | Mitigation/ Management Outcomes | Mitigation/Management Actions | Monitoring | | |
|---|---|---|---|---|---|
| | | | Methodology | Frequency | Responsibility |
| | | minibus | | | |
| 5.12. Increased incidents with pedestrians and livestock | Avoid incidents with pedestrians and livestock | ▪ Maintenance of farm fences | ▪ Fence construction and repair | Monthly | Property owners |
| | | ▪ Erect road signage informing motorists of property accesses and designated animal road crossings | ▪ Signpost construction | Once-off | Contractor<br>Project Developer<br>ECO |
| | | ▪ Maintain road verges along local and access roads to provide safe walking space for pedestrians. | ▪ Bush clearing and grass cutting | Bi-monthly | Contractor<br>Project Developer<br>ECO |
| 5.13. Increased need for road maintenance | Reduce/address deterioration of local roads | ▪ Reduce speed of vehicles in the vicinity of construction. | ▪ Erection of construction warning signs; training and evaluation of drivers and operators | Monthly | Contractor<br>Project Developer<br>ECO |
| | | ▪ Appropriate, timely and high-quality maintenance of gravel roads. | ▪ Road construction | As required | Contractor<br>Project Developer<br>ECO |
| | | ▪ Avoid use of gravel roads in wet weather | ▪ Programming of construction activities | During rain | Contractor<br>Project Developer<br>ECO |
| | | ▪ Implement a road maintenance programme under the auspices of the respective transport department(s). | ▪ Programming and road construction | Quarterly | Contractor<br>Project Developer<br>ECO |
| | | ▪ Continuous engagement with the NCDRPW and WCDTPW. | ▪ Programming and road construction | Quarterly | Contractor<br>Project Developer<br>ECO |

# 7. EROSION MANAGEMENT PLAN

| Impact | Mitigation/ Management Outcomes | Mitigation/Management Actions | Monitoring | | |
|---|---|---|---|---|---|
| | | | Methodology | Frequency | Responsibility |
| **A. PLANNING AND DESIGN PHASE** | | | | | |
| Soil degradation as a result of erosion. Erosion can occur as a result of the alteration of the land surface run-off characteristics, which can be caused by construction related land surface disturbance, vegetation removal, and the establishment of hard surface areas including roads. | Ensure that disturbance and existence of hard surfaces causes no erosion on or downstream of the site. | ▪ Design an effective system of storm water run-off control, where required (e.g., areas with concentrated volumes of run-off). The system must effectively collect and safely disseminate run-off water from all accumulation points and prevent down slope erosion. | ▪ Ensure that the storm water run-off control is included in the engineering design. | Once-off during the planning and design phase. | Project Developer |
| **B. CONSTRUCTION PHASE** | | | | | |
| Soil degradation as a result of erosion. Erosion can occur as a result of the alteration of the land surface run-off characteristics, which can be caused by construction related land surface disturbance, vegetation removal, and the establishment of hard surface areas including roads. | Ensure that disturbance and existence of hard surfaces causes no erosion on or downstream of the site. | ▪ Implement an effective system of storm water run-off control, where required. The system must effectively collect and safely disseminate run-off water from all accumulation points and prevent down slope erosion. | ▪ Undertake site inspections to verify the effectiveness and integrity of the storm water run-off control system and record any erosion on site or downstream. Corrective action must be implemented to the run-off control system if erosion occurs. | Every 2 months during the construction phase | ECO |
| Soil degradation as a result of erosion. Erosion can occur as a result of the alteration of the land surface run-off characteristics, which can be caused by construction | Ensure that vegetation clearing does not pose a high erosion risk. | ▪ Maintain where possible all vegetation cover and facilitate re-vegetation of denuded areas throughout the site, to stabilize disturbed soil against erosion. | ▪ Undertake a periodic site inspection to record the occurrence of and re-vegetation progress of all areas that require re-vegetation. | Every 3 months during the construction phase | ECO |

| Impact | Mitigation/ Management Outcomes | Mitigation/Management Actions | Monitoring | | |
|---|---|---|---|---|---|
| | | | Methodology | Frequency | Responsibility |
| related land surface disturbance, vegetation removal, and the establishment of hard surface areas including roads. | | | | | |
| Increased wind erosion and resultant deposition of dust | Prevent wind erosion and resultant deposition of dust on surrounding indigenous vegetation. | ▪ Sand, stone, and cement should be stored in demarcated areas, and covered or sealed to prevent wind erosion and resultant deposition of dust on the surrounding indigenous vegetation. | ▪ Undertake regular inspections of the via site audits to verify that sand, stone, and cement are stored and handled as instructed. | Daily | ECO<br>Contractor |
| | | ▪ During construction, efforts should be made to retain as much natural vegetation as possible on the site, to reduce disturbed areas and maintain plant cover, thus reducing erosion risks. | ▪ Monitor activities via site inspections and record and report non-compliance. | Daily | ECO<br>Contractor |
| | | ▪ All stockpiles must be protected from erosion and stored on flat areas where run-off will be minimised. Erosion and sedimentation into water bodies must be minimised through effective stabilisation. | ▪ Monitor the stockpiling process throughout the construction phase via visual site inspections. Record non-compliance and incidents. | Daily | ECO |
| Excessive loss of natural vegetation within the development footprint area from erosion | Prevent loss of natural vegetation through erosion. | ▪ Vegetation clearing during construction must be restricted to the footprint of the proposed project components and planned infrastructure only. It should be phased to ensure that the minimum area of soil is exposed to potential erosion at any one time. | ▪ Monitor vegetation clearing throughout the construction phase via visual site inspections. Record non-compliance and incidents.<br>▪ Undertake regular monitoring for erosion to ensure is reduced and rectified as soon as possible. | Daily<br>Daily | ECO<br>Contractor |
| | | ▪ Stockpile the shallow topsoil layer separately from the subsoil layers. Reinstate the topsoil layers (containing seed and vegetative material) when construction is complete to allow the plants to rapidly re-colonise the bare soil areas. | ▪ Rehabilitate disturbed areas and monitor the presence of alien invasive species on site. | Daily (stockpiling) and once-off for the reinstatement of the topsoil layer | ECO<br>Contractor |

| Impact | Mitigation/ Management Outcomes | Mitigation/Management Actions | Monitoring | | |
|---|---|---|---|---|---|
| | | | Methodology | Frequency | Responsibility |
| | | ▪ Re-seed with locally sourced seed of indigenous vegetation species. | ▪ Re-seed with seeds of indigenous grass species. | Once off | ECO with advice from a Terrestrial Ecology Specialist (if required) |
| | | ▪ Topsoil stockpiles not used in three months after stripping must be seeded to prevent dust and erosion. | ▪ Regular monitoring for erosion to ensure that no erosion problems are occurring at the site. All erosion problems observed should be rectified as soon as possible. | Weekly initially and thereafter monthly | ECO<br>Contractor |
| Erosion of surface soils, rilling and gulleys. | Measures to be implemented that address or avoid the loss of surface soils and exacerbates gulley formation. | ▪ Identify cause of erosion and possible means of redress (i.e., implement erosion control measures, where applicable), such as the use of geofabric, stone gabions and re-vegetation or similar measures.<br>▪ Erosion control measures should seek to reduce surface flow velocity and allow for settlement on site of silt laden surface waters. Washaways, excessive loss of soils and gulleys can be considered to be indicative of excessive erosion. | ▪ Monitor the erosion on site during construction, as well as the implementation and effectiveness of erosion control on site (such as the use of geofabric, stone gabions and re-vegetation or similar measures). | Ongoing and as required during erosion events. | ECO<br>Project Developer |
| **C. OPERATIONAL PHASE** | | | | | |
| Soil degradation as a result of erosion. Erosion can occur as a result of the alteration of the land surface run-off characteristics. | Ensure that disturbance and existence of hard surfaces causes no erosion on or downstream of the site. | ▪ Maintain the storm water run-off control system. Monitor erosion and remedy the storm water control system in the event of any erosion occurring. | ▪ Undertake site inspections to verify the effectiveness and integrity of the storm water run-off control system and record any erosion on site or downstream. Corrective action must be implemented to the run-off control system if erosion occurs. | Bi-annually | Project Developer |

| Impact | Mitigation/ Management Outcomes | Mitigation/Management Actions | Monitoring | | |
|---|---|---|---|---|---|
| | | | Methodology | Frequency | Responsibility |
| Soil degradation as a result of erosion. Erosion can occur as a result of the alteration of the land surface run-off characteristics. | That denuded areas are re-vegetated to stabilise soil against erosion. | ▪ Facilitate re-vegetation of denuded areas throughout the site. | ▪ Undertake a periodic site inspection to record the progress of all areas that require re-vegetation. | Bi-annually | Project Developer |
| Excessive loss of natural vegetation in the development footprint area and resulting impacts indigenous vegetation, faunal habitat, and habitat fragmentation. | Prevent loss of natural vegetation and minimise habitat fragmentation and the loss of connectivity as a result of erosion. | ▪ The use of silt fences, sandbags or other suitable methods must be implemented in areas that are susceptible to erosion. All erosion control mechanisms need to be regularly maintained. | ▪ Monitor efficiency of erosion control measures. | Weekly or monthly | Project Developer |
| | | ▪ Conduct regular monitoring for erosion to ensure that no erosion problems are occurring at the site as a result of the roads and other infrastructure. Ensure that all erosion problems are rectified as soon as possible. | ▪ Undertake regular monitoring for erosion to ensure is reduced and rectified as soon as possible. | Monthly | Project Developer |
| **D. DECOMMISSIONING PHASE** | | | | | |
| Soil degradation as a result of erosion. Erosion can occur as a result of the alteration of the land surface run-off characteristics, which can be caused by decommissioning related land surface disturbance, vegetation removal, and the establishment of hard surface areas including roads. | Ensure that disturbance and existence of hard surfaces causes no erosion on or downstream of the site. | ▪ Implement an effective system of storm water run-off control, where required. The system must effectively collect and safely disseminate run-off water from all accumulation points and prevent down slope erosion. | ▪ Undertake site inspections to verify the effectiveness and integrity of the storm water run-off control system and record any erosion on site or downstream. Corrective action must be implemented to the run-off control system if erosion occurs. | Every 2 months during the decommissioning phase, and then every 6 months after completion of decommissioning, until final sign-off is achieved. | ECO |
| Soil degradation as a result of erosion. Erosion can occur as a result of the alteration of the land surface run-off characteristics, which can be caused by decommissioning related land surface disturbance, vegetation removal, and the | Ensure that vegetation clearing does not pose a high erosion risk. | ▪ Maintain where possible all vegetation cover and facilitate re-vegetation of denuded areas throughout the site, to stabilize disturbed soil against erosion. | ▪ Undertake a periodic site inspection to record the occurrence of and re-vegetation progress of all areas that require re-vegetation. | Every 4 months during the decommissioning phase, and then every 6 months after completion of decommissioning, until final sign-off is achieved. | ECO |

| Impact | Mitigation/ Management Outcomes | Mitigation/Management Actions | Monitoring | | |
|---|---|---|---|---|---|
| | | | Methodology | Frequency | Responsibility |
| establishment of hard surface areas including roads. | | | | | |

## 8. HAZARDOUS SUBSTANCES, SPILLS, POLLUTION PREVENTION AND INCIDENTS

| Impact | Mitigation/ Management Outcomes | Mitigation/Management Actions | Monitoring | | |
|---|---|---|---|---|---|
| | | | Methodology | Frequency | Responsibility |
| **A. CONSTRUCTION PHASE** | | | | | |
| 8.1. Contamination of soil and risk of damage to vegetation and/or fauna through spillage of concrete and cement. | To control concrete and cement batching activities in order to reduce spillages and resulting contamination of soil, groundwater and the vegetation and/or fauna. | ▪ If any concrete mixing takes placed on site, this must be carried out in a clearly marked, designated area at the site camp on an impermeable surface (such as on boards or plastic sheeting and/or within a bunded area with an impermeable surface).<br>▪ Bagged cement must be stored in an appropriate facility and at least 10 m away from any water courses, gullies, and drains.<br>▪ A washout facility must be provided for washing of concrete associated equipment. Water used for washing must be restricted.<br>▪ Empty cement bags must be secured with adequate binding material if these will be temporarily stored on site. Empty cement bags must be collected from the construction area at the end of every day. Sand and aggregates containing cement must be kept damp to | ▪ Monitor the handling and storage of sand, stone and cement as instructed.<br>▪ Monitor waste disposal slips and waybills via site audits and record non-compliance and incidents. | Daily<br>Monthly | Project Developer<br>Contractor<br>ECO |

| Impact | Mitigation/ Management Outcomes | Mitigation/Management Actions | Monitoring | | |
|---|---|---|---|---|---|
| | | | Methodology | Frequency | Responsibility |
| | | prevent the generation of dust.<br>▪ Hardened concrete from the washout facility or concrete mixer can either be reused or disposed of at an appropriate licenced disposal facility. Proof of disposal (i.e., waste disposal slips or waybills) should be retained on file for auditing purposes.<br>▪ Any excess sand, stone and cement must be removed from site at the completion of the construction period and disposed at a licenced waste disposal facility. Proof of disposal (i.e., waste disposal slips or waybills) should be retained on file for auditing purposes. | | | |
| 8.2. Contamination of soil and risk of damage to vegetation and/or fauna through spillage of fuels and oils. | To control and eliminate fuel and oil spillages which may result in soil contamination and damage to vegetation and/or fauna. | ▪ Ensure that adequate containment structures are provided for the temporary storage of liquid dangerous goods and hazardous materials on site (such as chemicals, oil, fuel, hydraulic fluids, lubricating oils etc.). Appropriate bund areas must be provided for the storage of these materials at the site camp. Bund areas should contain an impervious surface in order to prevent spillages from entering the ground. Bund areas should have a capacity of 110 % of the volume of the largest tank in the bund (tanks include storage of fuel/diesel). Leak detection monitoring systems must be implemented. | ▪ Monitor the storage and handling of dangerous goods and hazardous materials on site via site audits and record non-compliance and incidents. | Weekly | Contractor<br>ECO |
| | | ▪ Monitor and inspect construction equipment and vehicles to ensure that no fuel spillage takes place. Ensure that drip trays are provided for construction equipment and vehicles as required. | ▪ Monitor the construction equipment and vehicles and monitor the occurrence of spills and the management process thereof.<br>▪ Record all spills and lessons learnt. | Daily<br>During spill events | Contractor<br>ECO<br>ECO |
| | | ▪ Contractor to compile a Method Statement for refueling activities under normal and emergency situations. If on-site servicing and refueling is required in emergency situations, a designated area must be created at the construction site camp for this purpose. Drip trays or similar impervious materials must be used during these procedures. | ▪ Verify if a Method Statement is compiled by reviewing approved and signed off reports.<br>▪ Monitor the refuelling/ servicing process and record the occurrence of any | Once-off prior to commencement of construction.<br>During emergency refuelling and servicing activities. | ECO<br>ECO |

| Impact | Mitigation/ Management Outcomes | Mitigation/Management Actions | Monitoring | | |
|---|---|---|---|---|---|
| | | | Methodology | Frequency | Responsibility |
| | | | spillages. | | |
| | | ▪ Spilled fuel, oil or grease must be retrieved, and contaminated soil removed, cleaned, and replaced. 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. | ▪ Monitor the handling and storage of fuels and oils via site audits and monitor and record if spillages have taken place and if so, are removed correctly and reported to authorities if significant. Monitor waste disposal slips and waybills via site audits and record non-compliance and incidents. | Daily (or during spills) | Contractor<br>ECO |
| | | ▪ Contaminated soil to be collected by the Contractor (under observation of the ECO) and disposed of at a registered waste facility designated for this purpose. Proof of disposal (i.e., waste disposal slips or waybills) should be retained on file for auditing purposes.<br>▪ All contaminated soil must first be treated (if required by the hazardous waste disposal facility) prior to disposal. Proof of treatment (such as waybills) should be retained on file for auditing purposes. | ▪ Monitor the correct removal / treatment of contaminated soil. Monitor waste disposal slips and waybills via site audits and record non-compliance and incidents. | Daily (or during spills) | Contractor<br>ECO |
| | | ▪ A Spill Response Method Statement must be compiled by the Contractor for the construction phase in order to manage potential spill events. | ▪ Compile a Spill Response Method Statement.<br>▪ Audit signed and approved Spill Response Method Statement. | Once-off (and thereafter updated as required during the construction phase).<br>Once-off (and thereafter as required during the construction phase). | Contractor<br>Project Developer<br>ECO |
| | | ▪ The Contractor must ensure that adequate spill containment and clean-up equipment are provided on site for use during spill events. | ▪ Monitor via site audits and record incidents and non-compliance. | Daily/Weekly | ECO<br>Contractor |

| Impact | Mitigation/ Management Outcomes | Mitigation/Management Actions | Monitoring | | |
|---|---|---|---|---|---|
| | | | Methodology | Frequency | Responsibility |
| | | ▪ Portable bioremediation kit (to remedy chemical spills) is to be held on site and used as required. | ▪ Ensure that a well-maintained portable bioremediation kit is available on site and that construction personnel and contractors are aware of its location and instructions | Daily | Contractor<br>ECO |
| | | ▪ In case of a spillage of hazardous chemicals where contamination of soil occurs, depending on the degree and level of contamination, excavation and removal to a hazardous waste disposal facility could be necessary. If the spillage is widespread and the soil is considered to be significantly contaminated, a specialist will need to be immediately appointed to address the spillage. This will usually entail the collection of samples of the contaminated soil followed by analysis in terms of the 2014 National Norms and Standards for the Remediation of Contaminated Land and Soil Quality (i.e., GN 331). If the soil is determined to be significantly contaminated, then compliance with Part 8 of the NEMWA should be achieved by the Applicant, including notifying the Minister of Environment, Forestry and Fisheries (DFFE) of the significant contamination. | ▪ Ensure that a suitably qualified specialist is appointed to collect and analyse the contaminated soil samples in terms of the 2014 Norms and Standards (i.e., GN 331) in order to determine if the soil is significantly contaminated or not.<br>▪ If the contaminated soil is considered to be significantly contaminated, then compliance with Part 8 of the NEMWA should be achieved by the Applicant. | During spill events | Project Developer |
| | | ▪ Northern Cape Department of Agriculture, Environmental Affairs, Rural Development and Land Reform is to be immediately duly notified of any incident in terms of Section 30 of the National Environmental Management Act (Act 107 of 1998, as amended) (NEMA). In terms of Section 30 of NEMA, an “incident” means an unexpected, sudden, and uncontrolled release of a hazardous substance, including from a major emission, fire, or explosion, that causes, has caused, or may cause significant harm to the environment, human life, or property.<br>▪ Pertaining to the above control of incidents, significant spills or leaks of hazardous substances (petrol and diesel) must be reported to all relevant authorities, | ▪ Ensure that this is undertaken via onsite inspections and reported to the authorities when required. | Throughout construction | ECO<br>Project Developer |

| Impact | Mitigation/ Management Outcomes | Mitigation/Management Actions | Monitoring | | |
|---|---|---|---|---|---|
| | | | Methodology | Frequency | Responsibility |
| | | including the Department, in accordance with Section 30(5) of the NEMA, 1998.<br>▪ The Department of Human Settlements, Water and Sanitation must be immediately notified of any pollution to surface water or groundwater resources due to the proposed project activities.<br>▪ Ensure that the Department of Human Settlements, Water and Sanitation Western Cape Region, Orange Water Management Area office is informed within 24 hours of any leaks or spills associated with the BESS. Ensure that under these circumstances, immediate clean-up procedures are conducted as stipulated in Section 19 of the National Water Act (Act 36 of 1998, as amended) (NWA); and that the spilled contaminants are disposed of at a permitted hazardous landfill site. In addition, during these situations, a remediation report for clean-up measures must be sent to this Department for comment before implementation. | | | |
| | | ▪ The Contractor must record and document all significant spill events. | ▪ Monitor documentation and records of significant spill events via audits and record non-compliance and incidents. | During spill events | ECO |
| 8.3. Impacts as a result of emergencies or incidents | Emergency procedures are in place to enable a rapid and effective response to all types of environmental emergencies | ▪ Compile an Emergency Response Action Plan (ERAP) prior to the commencement of the proposed project.<br>▪ The Emergency Plan must deal with accidents, potential spillages and fires in line with relevant legislation.<br>▪ All staff must be made aware of emergency procedures as part of environmental awareness training.<br>▪ The relevant local authority must be made aware of a fire as soon as it starts.<br>▪ In the event of emergency necessary mitigation measures to contain the spill or leak must be implemented. | ▪ Compile an ERAP<br>▪ Ensure that this is adhered to via onsite inspections and reported to the authorities when required.<br>▪ Ensure that this is undertaken via onsite inspections and reported to the authorities when required.<br>▪ Have emergency response drills to ascertain readiness and preparedness in terms of an emergency response. | ▪ Once-off (and thereafter updated as required during the construction phase).<br>▪ Throughout construction<br>▪ Throughout construction | Contractor<br>Project Developer<br>ECO<br>Throughout construction |

| Impact | Mitigation/ Management Outcomes | Mitigation/Management Actions | Monitoring | | |
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| | | | Methodology | Frequency | Responsibility |
| 8.4. Impacts to the environment and injuries to people as a result of fires | Prevention of uncontrollable fires. | ▪ Firefighting equipment must be available on all vehicles located on site.<br>▪ The local Fire Protection Agency (FPA) must be informed of construction activities.<br>▪ Contact numbers for the FPA and emergency services must be communicated in environmental awareness training and displayed at a central location on site.<br>▪ Two-way swop of contact details between ECO and FPA. | ▪ Ensure that this is in place via vehicle and onsite inspections and reported to the authorities when required.<br>▪ Inform the FPA of construction activities and swop contact details between ECO and FPAs. | ▪ Throughout construction<br>▪ At the start of construction | ECO<br>Project Developer |
| 8.5. Risk of injury to public | All precautions are taken to minimise the risk of injury, harm or complaints. | ▪ Identify fire hazards, demarcate and restrict public access to these areas as well as notify the local authority of any potential threats e.g., large brush stockpiles, fuels, hazardous waste, dangerous goods etc.<br>▪ All unattended open excavations must be adequately fenced or demarcated.<br>▪ Adequate protective measures must be implemented to prevent unauthorised access to and climbing of partly constructed towers and protective scaffolding.<br>▪ Ensure structures (including portable toilets) vulnerable to high winds are secured.<br>▪ Maintain an incidents and complaints register in which all incidents or complaints involving the public are logged. | ▪ Ensure all precautions and measures are in place to ensure the safety of the public.<br>▪ Maintain and check an incidents and complaints register. | ▪ Throughout construction<br>▪ Throughout construction on a daily or weekly basis as applicable | ECO and Project Developer<br>ECO to report all incidents and complaints to the Project Developer |
| **B. OPERATIONAL PHASE** | | | | | |
| 8.6. Contamination of soil and risk of damage to vegetation and/or fauna through spillage of fuels and oils | To control and eliminate fuel and oil spillages which may result in soil contamination and damage to vegetation and/or fauna. | ▪ The Applicant must apply for registration as a "Hazardous Waste Generator" with the Department's Integrated Pollutant and Waste Management System (IPWIS), as per the requirements of the National Waste Information Regulations published in GN No. R. 625 of 13 August 2012. This application should be completed online on the IPWIS website (http://ipwis.pgwc.gov.za/ipwis3/public/login). This needs to be done within 30 days of the commencement of the waste activity. | ▪ Verify that the Applicant has submitted the prerequisite application during the stipulated timeframe. | Once-off | Project Developer |
| | | ▪ Monitor and inspect maintenance equipment and vehicles to ensure that no fuel spillage takes place. | ▪ Implement specifications for maintenance equipment use as specified by the | Monthly | Project Developer |

| Impact | Mitigation/ Management Outcomes | Mitigation/Management Actions | Monitoring | | |
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| | | | Methodology | Frequency | Responsibility |
| | | | maintenance Contractor. | | |
| | | ▪ Spilled fuel, oil or grease is retrieved during operations where possible and contaminated soil removed, cleaned, and replaced.<br>▪ 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. | ▪ Monitor the handling and storage of fuels and oils via site audits and monitor and record if spillages have taken place and if so, are removed correctly and reported to authorities if significant.<br>▪ Monitor waste disposal slips and waybills via site audits and record non-compliance and incidents. | During spills | Project Developer |
| | | ▪ Contaminated soil to be collected by the Contractor and disposed of at a registered waste facility designated for this purpose. Proof of disposal (i.e., waste disposal slips or waybills) should be retained on file for auditing purposes.<br>▪ All soil contaminated must first be treated (if required by the hazardous waste disposal facility) prior to disposal. Proof of treatment (such as waybills) should be retained on file for auditing purposes. | ▪ Monitor the correct removal and/or treatment of contaminated soil. Monitor waste disposal and/or treatment slips and waybills via site audits and record non-compliance and incidents. | During spills | Project Developer |
| | | ▪ A Spill Response Plan must be compiled for the operational phase in order to manage potential spill events. | ▪ Compile a Spill Response Plan.<br>▪ Audit signed and approved Spill Response Method Statement. | ▪ Once-off (and thereafter updated as required).<br>▪ Once-off (and thereafter as required). | Project Developer<br>Facility Manager |
| | | ▪ Ensure that adequate spill containment and clean-up equipment are provided on site for use during spill events. Portable bioremediation kit (to remedy chemical spills) is to be held on site and used as required. | ▪ Ensure that a well-maintained portable bioremediation kit is available on site and that operational personnel are aware of its location and instructions. | ▪ Weekly | Facility Manager |

| Impact | Mitigation/ Management Outcomes | Mitigation/Management Actions | Monitoring | | |
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| | | | Methodology | Frequency | Responsibility |
| | | ▪ In case of a spillage of hazardous chemicals where contamination of soil occurs, depending on the degree and level of contamination, excavation and removal to a hazardous waste disposal facility could be necessary. If the spillage is widespread and the soil is considered to be significantly contaminated, a specialist will need to be immediately appointed to address the spillage. This will usually entail the collection of samples of the contaminated soil followed by analysis in terms of the 2014 National Norms and Standards for the Remediation of Contaminated Land and Soil Quality (i.e., GN 331). If the soil is determined to be significantly contaminated, then compliance with Part 8 of the NEMWA should be achieved by the Applicant, including notifying the Minister of Forestry, Fisheries and the Environment, of the significant contamination.<br>▪ In the event of a spill, contaminated soil must be collected in containers and stored in a central location and disposed of according to the National Environmental Management: Waste Act 59 of 2008. Refer to Sections 8.7 and 8.8 for procedures concerning storm and wastewater management, and solid and hazardous waste management. | ▪ Ensure that a suitably qualified specialist is appointed to collect and analyse the contaminated soil samples in terms of the 2014 Norms and Standards (i.e., GN 331) in order to determine if the soil is significantly contaminated or not.<br>▪ If the contaminated soil is considered to be significantly contaminated, then compliance with Part 8 of the NEMWA should be achieved by the Applicant. | During spill events | Project Developer |
| | | An Alphabetical Hazardous Chemical Substance (HCS) control sheet must be drawn up and kept up to date on a continuous basis.<br>▪ All hazardous chemicals that will be used on site must have Material Safety Data Sheets (MSDS). | ▪ Ensure Hazardous Chemical Substance (HCS) control sheets compiled and updated.<br>▪ Ensure Material Safety Data Sheets (MSDS) are kept filed. | ▪ Monthly and updated as required).<br>▪ Updated as required. | ▪ Facility Manager<br>▪ Environmental Manager |
| | | ▪ Northern Cape Department of Agriculture, Environmental Affairs, Rural Development and Land Reform is to be immediately duly notified of any incident in terms of Section 30 of the National Environmental Management Act (Act 107 of 1998, as amended) (NEMA). In terms of Section 30 of NEMA, an “incident” means an unexpected, sudden, and uncontrolled release of a hazardous substance, including from a major emission, fire, or | ▪ Ensure that this is undertaken via onsite inspections and reported to the authorities when required. | ▪ Throughout operations | ▪ Environmental Manager |

| Impact | Mitigation/ Management Outcomes | Mitigation/Management Actions | Monitoring | | |
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| | | | Methodology | Frequency | Responsibility |
| | | explosion, that causes, has caused, or may cause significant harm to the environment, human life, or property.<br>▪ Pertaining to the above control of incidents, significant spills or leaks of hazardous substances (petrol and diesel) must be reported to all relevant authorities, including the Department's Pollution and Chemicals Management Directorate, in accordance with Section 30(5) of the NEMA, 1998.<br>▪ The Department of Human Settlements, Water and Sanitation must be immediately notified of any pollution to surface water or groundwater resources due to the proposed project activities.<br>▪ Ensure that the Department of Human Settlements, Water and Sanitation Western Cape Region, Orange Water Management Area office is informed within 24 hours of any leaks or spills associated with the BESS. Ensure that under these circumstances, immediate clean-up procedures are conducted as stipulated in Section 19 of the National Water Act (Act 36 of 1998, as amended) (NWA); and that the spilled contaminants are disposed of at a permitted hazardous landfill site. In addition, during these situations, a remediation report for clean-up measures must be sent to this Department for comment before implementation. | | | |
| | | ▪ Ensure that adequate containment structures are provided for the temporary storage of liquid dangerous goods and hazardous materials on site (such as chemicals, oil, fuel, hydraulic fluids, lubricating oils etc.). Appropriate bund areas must be provided for the storage of these materials at the PV facility. Bund areas should contain an impervious surface in order to prevent spillages from entering the ground. Bund areas should have a capacity of 110 % of the volume of the largest tank in the bund (tanks include storage of fuel/diesel). Leak detection monitoring systems must be implemented. The floor of the bund must be sloped, draining to an oil | ▪ Monitor the storage and handling of dangerous goods and hazardous materials on site via site audits and record non-compliance and incidents. | ▪ Weekly | Facility Manager |

| Impact | Mitigation/ Management Outcomes | Mitigation/Management Actions | Monitoring | | |
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| | | | Methodology | Frequency | Responsibility |
| | | separator. Bunded areas to be suitably lined with a SABS approved liner.<br>▪ Provision must be made for refueling at the storage area by protecting the soil with an impermeable groundcover. Where dispensing equipment is used, a drip tray must be used to ensure small spills are contained.<br>▪ All empty externally dirty drums must be stored on a drip tray or within a bunded area.<br>▪ No unauthorised access into the hazardous substances storage areas must be permitted.<br>▪ No smoking must be allowed within the vicinity of the hazardous storage areas.<br>▪ Adequate fire-fighting equipment must be made available at all hazardous storage areas.<br>▪ Where refueling away from the dedicated refueling station is required, a mobile refueling unit must be used. Appropriate ground protection such as drip trays must be used.<br>▪ An appropriately sized spill kit kept onsite relevant to the scale of the activity/s involving the use of hazardous substance must be available at all times.<br>▪ The responsible operator must have the required training to make use of the spill kit in emergency situations.<br>▪ An appropriate number of spill kits must be available and must be located in all areas where activities are being undertaken. | | | |
| 8.7. Potential risk to employees due to incorrect handing of hazardous waste | Prevent injuries to employees | ▪ All employees working with HCS must be trained in the safe use of the substance and according to the safety data sheet.<br>▪ Employees handling hazardous substances / materials must be aware of the potential impacts and follow appropriate safety measures. Appropriate personal protective equipment must be made available. | ▪ Carry out Environmental Awareness Training.<br>▪ Conduct audits of the signed attendance registers. | Once-off training and ensure that all new staff are inducted.<br>Monthly | Environmental Manager<br>Facility Manager |
| 8.8. Impacts due to management solid and liquid wastes disposed | Prevent environmental impacts as a result of the operational phase such as | ▪ All operation waste to be removed from the site by an appointed service provider. | ▪ Waste removal and disposal to be monitored throughout operation. | Monthly | Facility Manager |

| Impact | Mitigation/ Management Outcomes | Mitigation/Management Actions | Monitoring | | |
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| | | | Methodology | Frequency | Responsibility |
| of on the site during operational phase. | pollution. | ▪ All liquid waste or spills (used oil, paints, lubricating compounds and grease from vehicles passing through the entrance facility) to be packaged and disposed appropriately at a registered landfill site. | ▪ Monitor the correct removal of liquid waste or spills. Monitor waste disposal slips and waybills via site audits and record non-compliance and incidents. | During spills | Project Developer |
| | | ▪ Adequate containers for the cleaning of equipment and materials (paint, solvent) must be provided in order to avoid spillages. | ▪ Monitor the storage and handling of dangerous goods and hazardous materials on site via site audits and record non-compliance and incidents. | Weekly | Facility Manager |
| **C. DECOMMISSIONING PHASE** | | | | | |
| 8.9. No specific impacts are associated with the decommissioning phase other than those from the operational phase that will still be relevant for the duration of the decommissioning phase due to on-going occupation of the area. | | | | | |

# 9. ENVIRONMENTAL AWARENESS AND FIRE MANAGEMENT PLAN

| Impact | Mitigation/ Management Outcomes | Mitigation/Management Actions | Monitoring | | |
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| | | | Methodology | Frequency | Responsibility |
| **A. PLANNING AND DESIGN PHASE** | | | | | |
| 9.1. Potential impacts resulting from the lack of overall compliance with the conditions of the EA (issued by the DFFE) | Ensure compliance with all environmental conditions of approval (issued by the DFFE as part of the EA). | ▪ Audit the implementation of the EMPr requirements. | ▪ Audit report on compliance with actions and monitoring requirements of the EMPr. | ▪ Weekly | Project Developer |
| | | ▪ Establish clear and transparent reporting of the activities undertaken with regards to all recommendations included in the EMPr. | ▪ Audit report on compliance with actions and monitoring requirements included in the EMPr. | ▪ Weekly | Project Developer |
| **B. CONSTRUCTION PHASE** | | | | | |
| 9.2. Potential risk of fire due to construction activities or behaviour of staff on site during the construction phase | Prevent fire on site resulting of workers smoking or starting fires (i.e., cooking, heating purposes). | ▪ Designate smoking areas, as well as areas for cooking, where the fire hazard could be regarded as insignificant. | ▪ Ad-hoc checks to ensure workers are smoking or cooking in designated areas only. | ▪ Daily | ECO<br>Contractor |
| | | ▪ Educate workers on the dangers of open and/or unattended fires. | ▪ Ensure fire safety requirements are well understood and respected by construction personnel.<br>▪ Carry out Environmental Awareness Training.<br>▪ Conduct audits of the signed attendance registers. | ▪ Ongoing.<br>▪ Once-off training and ensure that all new staff are inducted.<br>▪ Monthly | ▪ ECO and Contractor<br>▪ Contractor/ ECO<br>▪ ECO |
| | | ▪ Prohibit open fires. Appropriate fire safety training should also be provided to staff that are to be on the site for the duration of the construction phase.<br>▪ Erect and maintain information posters on the risk of unauthorised fires. | ▪ Ensure fire safety requirements are well understood and respected by construction personnel. Provide basic fire safety training.<br>▪ Ensure information posters outlining the risks of unauthorized fires are visible at all times. | ▪ On-going | ECO<br>Contractor |
| | | ▪ Ensure that cooking takes place in a designated area shown on the site map. Ensure that no firewood or kindling may be gathered from the site or surrounds. | ▪ Check compliance with specified conditions using a report card and allocate fines when necessary. | ▪ On-going | ECO<br>Contractors |

| Impact | Mitigation/ Management Outcomes | Mitigation/Management Actions | Monitoring | | |
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| | | | Methodology | Frequency | Responsibility |
| | | ▪ Prohibit the use of fire for cooking. | ▪ Ad-hoc checks to ensure workers are cooking in designated areas only. | ▪ Daily | ECO<br>Contractor |
| | | ▪ Fire-fighting equipment must be made available at various appropriate locations on the construction site. | ▪ Ensure fire safety requirements are well understood and respected by workers.<br>▪ Assurance of functionality of fire extinguishers via inspections and certification by an accredited fire service company. | ▪ On-going<br>▪ Bi-annually | ▪ ECO and Contractor<br>▪ Contractor |
| 9.3. Inappropriate behaviour of civil contractors and sub-contractors during the construction phase | Prevent unnecessary impacts on the surrounding environment by ensuring that contractors are aware of the requirements of the EMPr.<br><br>Ensure that contractors and sub-contractors do not induce impacts on the surrounding environment as a result of unplanned pollution on site.<br><br>Ensure that actions by on-site contractors and sub-contractors and workers are properly managed in order to minimise impacts to surrounding environment. | ▪ Ensure that the EMPr and the EA (should it be granted), are included in all tender documentation and contractors and sub-contractors' contracts. | ▪ Check compliance with specified conditions using a report card and allocate fines when necessary. | ▪ On-going | ECO<br>Contractor |
| | | ▪ Contractors and sub-contractors must use the ablution facilities situated in a designated area within the site; and no bathing/washing should be permitted outside the designated area.<br>▪ Portable chemical toilet/s (ablution facilities) at the construction camp, must be serviced weekly for the duration of the construction phase.<br>▪ Care should be taken with the installation of conservancy tanks to prevent cracks that could lead to leaks over time. Proper and regular servicing must be scheduled to prevent possible groundwater contamination. | ▪ Check compliance with specified conditions using a report card and allocate fines when necessary. | ▪ On-going | ECO<br>Contractor |
| | | ▪ All litter will be deposited in a clearly labelled, closed, animal-proof disposal bin in the construction area; particular attention needs to be paid to food waste. | ▪ Check compliance with specified conditions using a report card and allocate fines when necessary. | ▪ On-going | ECO<br>Contractors |
| | | ▪ It is recommended that the removed vegetation be taken to a garden waste chipping facility for composting or be disposed of at an appropriately licenced facility, but it may not be disposed of within the development footprint. | ▪ Monitor compliance and record non-compliance and incidents. | ▪ On-going | ECO<br>Contractors |

| Impact | Mitigation/ Management Outcomes | Mitigation/Management Actions | Monitoring | | |
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| | | | Methodology | Frequency | Responsibility |
| | | ▪ No person other than qualified specialist or personnel authorised by the Project Developer, will disturb, or remove plants outside the demarcated construction area. | ▪ Check compliance with specified conditions using a report card and allocate fines when necessary. | ▪ On-going | ECO<br>Contractors |
| | | ▪ No person other than qualified specialist or personnel authorised by the Project Developer, will disturb animals on the site. | ▪ Check compliance with specified conditions using a report card and allocate fines when necessary. | ▪ On-going | ECO<br>Contractors |
| | | ▪ Educate workers on site about suitable behaviour on site and initiate environmental awareness. Staff must be informed that no trapping, snaring, or feeding of any animal will be allowed. | ▪ Carry out Environmental Awareness Training.<br>▪ Conduct audits of the signed attendance registers. | ▪ Once-off training and ensure that all new staff are inducted.<br>▪ Monthly | ▪ Contractor/ ECO<br>▪ ECO |
| 9.4. Inappropriate planning of site camp establishment. | Ensure that environmental issues are taken into consideration in the planning for site establishment. | ▪ All construction activities, materials, equipment, and personnel must be restricted to the actual construction area specified (as required to undertake the construction work), which includes the project footprint area and access roads. The construction area must be demarcated by the Contractor (excluding the access roads). | ▪ Monitor compliance and record non-compliance and incidents. | ▪ Before construction | ECO |
| | | ▪ The Contractor should install and maintain Construction Site Information Boards in the position, quantity, design, and dimensions specified by the Project Developer. | ▪ Monitor compliance and record non-compliance and incidents. | ▪ Before construction | ECO |
| | | ▪ General building materials should be stored in appropriate designated areas on site such that there will be no runoff from these areas towards sensitive systems. The site camp must be removed after construction. | ▪ Monitor compliance and record non-compliance and incidents. | ▪ Before construction | ECO |
| 9.5. Increased animal road mortality | Reduction in animal mortality | ▪ The construction staff should be made aware of the presence of fauna and within the proposed project area. The construction personnel and staff must also be made aware of the general speed limits on site and must be alert at all times for potential crossings and should be trained on how to react in these situations. | ▪ Carry out Environmental Awareness Training.<br>▪ Conduct audits of the signed attendance registers. | ▪ Once-off training and ensure that all new staff are inducted.<br>▪ Monthly | ▪ Contractor/ ECO<br>▪ ECO |

| Impact | Mitigation/ Management Outcomes | Mitigation/Management Actions | Monitoring | | |
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| | | | Methodology | Frequency | Responsibility |
| | | ▪ To ensure that animals are not attracted to the site (and potentially resulting in increased road mortality), the waste collection bins and skips should be covered with suitable material, where appropriate, and the site camp must be kept clean on a daily basis. | ▪ Monitor the activities via visual inspections, and record and report any non-compliance. | ▪ Daily | Contractor<br>ECO |
| | | ▪ Establish a monitoring programme to record the number of faunal road mortalities and collisions. If it is established that the number of collisions and faunal fatalities increase within a specific area, then identify appropriate actions such as additional road signage and driver education to raise awareness. | ▪ Appropriate monitoring and recording of mortalities should be undertaken.<br>▪ Additional signage and driver education to be implemented if required. | ▪ Weekly<br>▪ As required | ▪ ECO<br>▪ ECO and Contractor |
| 10. Increased energy consumption during the construction phase | Reduce energy consumption where possible | ▪ Encourage the use of energy saving equipment at the site camp site (such as low voltage lights and low-pressure taps) and promote recycling. Construction personnel must be made aware of energy conservation practices as part of the Environmental Awareness Training programme. | ▪ Contractor to monitor energy usage via audits.<br>▪ Carry out Environmental Awareness Training.<br>▪ Conduct audits of the signed attendance registers. | ▪ Monthly<br>▪ Once-off training and ensure that all new staff are inducted.<br>▪ Monthly | ▪ Contractor<br>▪ Contractor/ ECO<br>▪ ECO |
| 11. Impact on the regional water balance as a result of increased water usage | Reduce water usage during the construction phase | ▪ Water conservation should be practiced as follows:<br>- Implement water saving measures.<br>- Cleaning methods utilised for cleaning vehicles, floors, etc. should aim to minimise water use (e.g., sweep before wash-down).<br>- Ensure that regular audits (i.e., twice weekly) of water systems and all water-related infrastructure (e.g., pipes, pumps, reservoirs, toilets, taps, etc.) are conducted to identify possible water leakages. Such infrastructure must be immediately repaired.<br>- Avoid the use of potable water for dust suppression during the construction phase and consider the use of alternative approved sources, where possible. | ▪ Monitor via site audits and record non-compliance and incidents. | ▪ Monthly | ECO |
| | | ▪ Make construction personnel aware of the | ▪ Carry out Environmental Awareness | ▪ Once-off training and | ▪ Contractor/ |

| Impact | Mitigation/ Management Outcomes | Mitigation/Management Actions | Monitoring | | |
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| | | | Methodology | Frequency | Responsibility |
| | | importance of limiting water wastage, as well as reducing water use. | Training with a discussion on water usage and conservation.<br>▪ Conduct audits of the signed attendance registers. | ensure that all new staff are inducted.<br>▪ Monthly | ECO<br>▪ ECO |
| 12. Non respect of waste management practices | Minimise the production of general waste.<br><br>Ensure compliance with relevant waste management legislation.<br><br>Minimise pollution of the environment.<br><br>Maximise recycling practices to minimise waste and maximise the sustainability impact of the project. | ▪ Control and implement waste management plans. Ensure that relevant legislative requirements are respected.<br>▪ Implement the waste management hierarchy, using the most environmentally friendly steps to divert disposal of waste to landfill.<br>▪ Determine specific areas on site for temporary management of waste.<br>▪ Promote waste reduction, re-use, and recycling opportunities on site during the operational phase.<br>▪ The required infrastructure, such as bins and storage areas, should be available to ensure the ease of separation of waste at the source, and waste diversion.<br>▪ All recyclable waste generated should be managed and made available to recyclers.<br>▪ It is recommended that the removed vegetation be taken to a garden waste chipping facility for composting or be disposed of at an appropriately licenced facility, but it may not be disposed of within the development footprint.<br>▪ Ensure an adequate and sustainable use of resources. | ▪ Control of waste generation and waste management practices throughout construction phase. | ▪ Monthly | Facility Manager |
| **C. OPERATIONAL PHASE** | | | | | |
| 13. Potential risk of fire due to behaviour of staff on site during the operational | Ensure appropriate and efficient fire prevention during the operational phase. | ▪ Designate smoking areas where the fire hazard could be regarded as insignificant.<br>▪ Prohibit the use of fire for cooking. | ▪ Random inspections to ensure workers are smoking in designated areas only.<br>▪ Random inspections to ensure that | ▪ Monthly | Facility Manager |

| Impact | Mitigation/ Management Outcomes | Mitigation/Management Actions | Monitoring | | |
|---|---|---|---|---|---|
| | | | Methodology | Frequency | Responsibility |
| phase | | | workers are not using fire for cooking. | | |
| | | ▪ Educate workers on the dangers of open and/or unattended fires. | ▪ Ensure fire safety requirements are well understood and respected by operational personnel.<br>▪ Carry out Environmental Awareness Training.<br>▪ Conduct audits of the signed attendance registers. | ▪ Ongoing<br>▪ Once-off training and ensure that all new staff are inducted.<br>▪ Monthly | ▪ Facility Manager<br>▪ Facility Manager<br>▪ Facility Manager |
| | | ▪ Prohibit open fires. Appropriate fire safety training should also be provided to staff that are to be on the site for the duration of the operational phase. | ▪ Ensure fire safety requirements are well understood and respected by operational personnel. Provide basic fire safety training. | ▪ On-going | Project Developer |
| | | ▪ Ensure that adequate fire-fighting equipment is available and easily accessible on site. | ▪ Ensure fire safety requirements are well understood and respected by workers.<br>▪ Assurance of functionality of fire extinguishers via inspections and certification by an accredited fire service company. | ▪ On-going<br>▪ Bi-annually | ▪ Facility Manager<br>▪ Project Developer |
| 14. Increased energy consumption during the operational phase. | Reduce energy consumption where possible. | ▪ Encourage the use of energy saving equipment at the PV facility (such as low voltage lights and low-pressure taps) and promote recycling. Operational personnel must be made aware of energy conservation practices as part of the environmental awareness training programme. | ▪ Monitor energy usage via site investigations.<br>▪ Conduct training for all operational personnel. | ▪ Monthly<br>▪ As and when required and ensure that all new staff are inducted. | ▪ Facility Manager<br>▪ Project Developer |
| 15. Impact on the regional water balance as a result of increased water usage. | Reduce water usage during operations. | ▪ Water conservation to be practiced in line with Energy Saving Policies as follows:<br>▪ Cleaning methods utilised for cleaning vehicles, floors, the offices etc. should aim to minimise water use (e.g., sweep before wash-down).<br>▪ Where possible, encourage the re-use of water.<br>▪ Ensure that regular audits (i.e., twice weekly) of water systems and all water-related infrastructure (e.g., pipes, pumps, reservoirs, toilets, taps, etc.) are conducted to identify possible water leakages. Such infrastructure must be | ▪ Record water usage during the operational phase, conduct audits and record non-compliance and incidents. | ▪ Monthly | Facility Manager |

| Impact | Mitigation/ Management Outcomes | Mitigation/Management Actions | Monitoring | | |
|---|---|---|---|---|---|
| | | | Methodology | Frequency | Responsibility |
| | | immediately repaired.<br>▪ Consider installing water saving devices (e.g., dual flush toilets, automatic shut-off taps, etc.). | | | |
| | | ▪ Carry out environmental awareness training with a discussion on water usage and conservation and make operational personnel aware of the importance of limiting water wastage. | ▪ Conduct training for all operational personnel. | ▪ As and when required during operations and ensure that all new staff are inducted. | Facility Manager |
| 16. Non respect of waste management practices | Minimise the production of general waste.<br><br>Ensure compliance with relevant waste management legislation.<br><br>Minimise pollution of the environment.<br><br>Maximise recycling practices | ▪ Control and implement waste management plans. Ensure that relevant legislative requirements are respected.<br>▪ Implement the waste management hierarchy, using the most environmentally friendly steps to<br>▪ divert disposal of waste to landfill.<br>▪ Determine specific areas on site for temporary management of waste. | ▪ Control of waste management practices throughout operation phase. | ▪ Monthly | Facility Manager |
| | | ▪ Promote waste reduction, re-use, and recycling opportunities on site during the operational phase.<br>▪ The required infrastructure, such as bins and storage areas, should be available to ensure the ease of separation of waste at the source, and waste diversion.<br>▪ All recyclable waste generated should be managed and made available to recyclers.<br>▪ It is recommended that the removed vegetation be taken to a garden waste chipping facility for composting or be disposed of at an appropriately licensed facility, but it may not be disposed of within the development footprint.<br>▪ Ensure an adequate and sustainable use of resources. | ▪ Monitor waste generation and collection throughout operation. | ▪ Monthly | Facility Manager |
| 17. Excessive generation of wastewater on site during the operation phase | Maintain reasonable levels of wastewater generation | ▪ Wastewater must be collected and disposed of at a suitable licensed disposal facility. Proof of disposal (i.e., waste disposal slips or waybills) should be retained on file for auditing purposes. | ▪ Wastewater generation to be monitored throughout the operational phase.<br>▪ Monitor waste disposal slips and waybills via site audits and record non- | ▪ Quarterly | Facility Manager |

| Impact | Mitigation/ Management Outcomes | Mitigation/Management Actions | Monitoring | | |
|---|---|---|---|---|---|
| | | | Methodology | Frequency | Responsibility |
| | | | compliance and incidents. | | |
| **D. DECOMMISSIONING PHASE** | | | | | |
| 18. Ensure that the construction mitigation and management measures are adhered to during the decommissioning phase. | | | | | |

# 10. SPECIFIC PROJECT RELATED ENVIRONMENTAL IMPACTS

## 10.1 PLANNING AND DESIGN PHASE

| Impact | Mitigation/ Management Outcomes | Mitigation/Management Actions | Monitoring | | |
|---|---|---|---|---|---|
| | | | Methodology | Frequency | Responsibility |
| **A. PLANNING AND DESIGN PHASE** | | | | | |
| **A.1. AGRICULTURE AND SOILS IMPACTS** | | | | | |
| • Soil degradation and erosion | That disturbance and existence of hard surfaces causes no erosion on or downstream of the site. | ▪ A system of stormwater management, which will prevent erosion on and downstream of the site, will be an inherent part of the engineering on site. Any occurrences of erosion must be attended to immediately and the integrity of the erosion control system at that point must be amended to prevent further erosion from occurring there.<br>▪ Any excavations done during the construction phase, in areas that will be re-vegetated at the end of the construction phase, must separate the upper 20 cm of topsoil from the rest of the excavation spoils and store it in a separate stockpile. When the excavation is back-filled, the topsoil must be back-filled last, so that it remains at the surface. Topsoil should only be stripped in areas that are excavated. Across most of the site, including construction lay down areas, it will be much more effective for rehabilitation, to retain the topsoil in place. If levelling requires significant cutting, topsoil should be temporarily stockpiled and then re-spread after cutting, so that there is a covering of topsoil over the entire cut surface. It will be advantageous to have topsoil and vegetation cover below the panels during the operational phase to control dust and erosion. | ▪ Ensure that the stormwater run-off control is included in the engineering design and that the SWMP is part of the contractor's contract documentation. | ▪ Once-off during the design phase. | ▪ EA holder |

| Impact | Mitigation/ Management Outcomes | Mitigation/Management Actions | Monitoring | | |
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| **A.2. VISUAL IMPACTS** | | | | | |
| • Potential alteration of the visual character and sense of place resulting from construction activities intrusion resulting from large construction vehicles and equipment. | Minimise exposure of visual receptors to visual impacts. | ▪ Plan carefully to minimise the construction period and to avoid construction delays.<br>▪ The following planning measures are to be taken into account prior to the commencement of the Construction Phase:<br>- Restrict construction activities to daylight hours in order to negate or reduce the visual impacts associated with lighting.<br>- Position laydown areas and related storage/stockpile areas in unobtrusive positions in the landscape, where possible.<br>- Minimise vegetation clearing and rehabilitate cleared areas as soon as possible.<br>- Vegetation clearing should take place in a phased manner.<br>- Inform any receptors within 500 m of the site of the construction programme and schedules.<br>- Make use of existing gravel access roads where possible.<br>- Limit the number of vehicles and trucks travelling to and from the proposed sites, where possible.<br>- Ensure that suitable dust suppression techniques are implemented:<br>o on all access roads;<br>o in all areas where vegetation clearing has taken place;<br>o on all soil stockpiles.<br>- Maintain a neat construction site by removing litter, rubble and waste materials regularly. | ▪ Ensure that the mitigation/ management actions are taken into consideration during the design phase | ▪ Once off during the design phase. | ▪ EA holder and ECO |

| Impact | Mitigation/ Management Outcomes | Mitigation/Management Actions | Monitoring | | |
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| **A.3. TERRESTRIAL AND AQUATIC BIODIVERSITY AND SPECIES IMPACTS** | | | | | |
| • Loss of aquatic species of special concern (SSC) | To reduce the loss of and impact on aquatic species and SSC | ▪ A preconstruction walkdown must be conducted to identify any areas that may contain any aquatic SSC so that these can be demarcated and avoided in the final design process.<br>▪ Any remaining species that could not be avoided must then be relocated in a Search and Rescue programme that should be initiated prior to construction.<br>▪ Develop a Construction Specific Monitoring and Rehabilitation Plan for inclusion into the EMPr prior to the commencement of the construction phase. | ▪ Ensure that a preconstruction walkdown and plant rescue and relocation is taken into consideration during planning and design phase and implemented during the construction phase. The specialist shall, in addition to the micrositing of the facilities' boundary, provide input into the the SWMP (see Section 5 of this EMPr). | ▪ Once off during the design phase. | ▪ Project Developer<br>▪ Contractor<br>▪ ECO |
| • Destruction / clearance of indigenous and protected vegetation | Ensure compliance with relevant Provincial and National legislation in respect of habitat and species permits. | ▪ Ensure the necessary permits or licenses are identified and applied for as applicable for removal of indigenous vegetation, especially for protected species. Provincially protected species must be avoided during the construction activities where it will be impacted on by construction activities. Alternatively, permits for the rescue i.e., removal and translocation or destruction, where relevant, of any of these protected species must be applied for and granted by the provincial authority.<br>▪ Await response and provision of permit (as required) from the relevant Authorities prior to the removal of the indigenous species (if required). Once these permits are obtained, search and rescue must be undertaken for the relevant indigenous species prior to the commencement of construction activities. | ▪ Review the findings of the Specialist Assessments and consider legislative requirements in respect of loss of indigenous and protected vegetation.<br>▪ Review the approved site plan with the ECO and appoint a suitable terrestrial ecologist to undertake a walk-through of the final approved site layout prior to construction.<br>▪ Contact the relevant Provincial and National Environmental Authorities to discuss and confirm if any protected species need to be relocated or rescued and undertake the required permit application processes.<br>▪ Appoint a suitable specialist and/or contractor to undertake plant search and rescue for the plants earmarked for removal | ▪ Once-off (and renewed during construction phase as required) | ▪ Project Developer and ECO / Specialist / Contractor |

| Impact | Mitigation/ Management Outcomes | Mitigation/Management Actions | Monitoring | | |
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| | | | and/or relocation as per the approved permits. | | |
| • Harm, displacement, or mortality of indigenous and protected fauna | Ensure compliance with relevant Provincial and National legislation in respect of species capture and relocation permits. | ▪ Ensure the necessary permits or licenses are identified and applied for as applicable for relocation of indigenous fauna, especially for protected species. Alternatively, permits for the rescue i.e., capture and relocation, where relevant, of any of these protected species must be applied for and granted by the provincial authority.<br>▪ Await response and provision of permit (as required) from the relevant Authorities prior to the removal of the faunal species (if required). Once these permits are obtained, search and rescue must be undertaken for the relevant species prior to the commencement of construction activities. | ▪ Review the findings of the Specialist Assessments and consider legislative requirements in respect of loss of indigenous and protected fauna.<br>▪ Review the approved site plan with the ECO and appoint a suitable terrestrial ecologist to undertake a walk-through of the final approved site layout prior to construction.<br>▪ Contact the relevant Provincial and National Environmental Authorities to discuss and confirm if any protected species need to be relocated or rescued and undertake the required permit application processes.<br>▪ Appoint a suitable specialist and/or contractor to undertake plant search and rescue for the plants earmarked for capture and/or relocation as per the approved permits. | ▪ Once-off (and renewed during construction phase as required) | ▪ Project Developer and ECO / Specialist / Contractor |
| • Loss of ecosystem services, and or habitats that would result in habitat fragmentation, especially those included in any Biodiversity Conservation plans as Critical Biodiversity areas or Ecological Support Areas. This in turn could also lead to habitat fragmentation | | ▪ Develop and implement a Construction Rehabilitation and Monitoring Plan post Environmental Authorisation. This must be developed following the finalisation of the road layout and a walk down has been completed. This plan should include relocation of suitable plant species, but more important protect any topsoil stores and promote the collection of vegetative material and propagules / seed to assist with the revegetation of the site.<br>▪ Where possible, temporary construction lay- | ▪ Ensure that a Construction and Rehabilitation and Monitoring has been implemented.<br>▪ Ensure that the mitigation/ management actions are complied with in the design phase prior to construction commencing. | ▪ Once off during the design phase.<br>▪ Ongoing | ▪ ECO<br>▪ Contractor |

| Impact | Mitigation/ Management Outcomes | Mitigation/Management Actions | Monitoring | | |
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| | | down or assembly areas should be sited in transformed areas. | | | |
| • Displacement of any animals because of any disturbance or habitat loss. This includes animal mortalities related to construction vehicle traffic | To reduce the displacement of any animals because of any disturbance or habitat loss. | ▪ Clear demarcation during the construction phase of all undisturbed sensitive areas that are not within the direct footprint to ensure that there is no uncontrolled access by construction vehicles and labourers.<br>▪ Educate contractors as to the importance of the undisturbed conservations areas and importance of avoiding them. | ▪ Ensure that the mitigation/ management actions are complied with in the design phase prior to construction commencing. | ▪ Once off during the design phase. | ▪ Project Applicant<br>▪ Contractor |
| • Damage or loss of riparian and riverine systems and disturbance of the waterbodies in the construction phase | To reduce the loss of and impact on aquatic ecosystems | ▪ A pre-construction walkthrough by an aquatic specialist is recommended so they can assist with the development of the Stormwater Management Plan (SWMP) and Aquatic Construction Rehabilitation and Monitoring Plan, coupled to micro-siting of the final layout.<br>▪ Suitable stormwater management systems must be installed along roads and other areas and monitored during the first few months of use. Any erosion / sedimentation must be resolved through whatever additional interventions maybe necessary (i.e., extension, energy dissipaters, spreaders, etc).<br>▪ Furthermore, the following applies to watercourse crossing upgrades associated with the proposed development:<br>o All pipe culverts must be removed and replaced with suitable sized box culverts, where road levels are raised.<br>o River levels, regardless of the current state of the river / water course will be reinstated thus preventing any impoundments from being formed. The related designs must be assessed by an aquatic specialist during a pre-construction walkdown.<br>o Where large cut and fill areas are required, these must be stabilised and rehabilitated during the construction process, to minimise erosion and sedimentation. | ▪ Ensure that the mitigation/ management actions are taken into consideration during planning and design phase and implemented during the construction and decommissioning phases. | ▪ Once off during the design phase. | ▪ Project Developer<br>▪ Contractor<br>▪ ECO |

| Impact | Mitigation/ Management Outcomes | Mitigation/Management Actions | Monitoring | | |
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| | | ○ Monitoring<br>▪ All alien plant re-growth, which is currently low within the greater region must be monitored and should it occur, these plants must be eradicated within the project footprints and especially in areas near the proposed crossings. | | | |
| • Impact on localised surface water quality (Spills and leaks from construction vehicles / machinery when working in or near the delineated systems) | Avoid, prevent and minimise the impact on water quality | ▪ All liquid chemicals including fuels and oil, including for the BESS, must be stored in with secondary containment (bunds or containers or berms) that can contain a leak or spill. Such facilities must be inspected routinely and must have the suitable PPE and spill kits needed to contain likely worst-case scenario leak or spill in that facility, safely.<br>▪ Washing and cleaning of equipment must be done in designated wash bays, where rinse water is contained in evaporation/sedimentation ponds (to capture oils, grease cement and sediment).<br>▪ Mechanical plant and bowsers must not be refuelled or serviced within 100m of a river channel (even if dry).<br>▪ All construction camps, laydown areas, wash bays, batching plants or areas and any stores should be more than 50m from any demarcated water courses.<br>▪ Littering and contamination associated with construction activity must be avoided through effective construction camp management.<br>▪ No stockpiling should take place within or near a water course.<br>▪ All stockpiles must be protected and located in flat areas where run-off will be minimised and sediment recoverable. | ▪ Ensure that the mitigation/ management actions are taken into consideration during planning and design phase and implemented during the construction and decommissioning phases. | ▪ Once off during the design phase. | ▪ Project Developer<br>▪ Contractor<br>▪ ECO |
| **A.5. AVIFAUNA IMPACTS** | | | | | |
| • Collisions with PV panels | Minimise avifaunal fatalities and injuries due to PV panel collisions | ▪ Single-fence design | ▪ Ensure that single fence design is taken into consideration during planning and design phase and implemented during the | ▪ Once off prior to construction | ▪ Project Developer<br>▪ ECO |

| Impact | Mitigation/ Management Outcomes | Mitigation/Management Actions | Monitoring | | |
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| | | | construction phase. | | |
| • Disturbance and displacement of avifauna during the construction phase<br>• Habitat loss and displacement during the construction phase | Minimise disturbance and displacement of avifauna | ▪ Avifaunal pre-construction walkthrough.<br>▪ Minimisation of disturbance footprint to the development footprint<br>▪ Ensure that the layout avoids sensitive areas identified by the avifauna specialist. | ▪ Ensure that the minimisation of the disturbance footprint is taken into consideration during planning and design phase and implemented prior to the construction phase. | ▪ Avifaunal survey to take place prior to the construction phase<br>▪ Once off during the design phase | ▪ Project Developer<br>▪ ECO<br>▪ Appointed avifaunal specialist |
| **A.6. HERITAGE IMPACTS** | | | | | |
| • Damage or destruction of archaeological sites or graves | Rescue information, artefacts or burials before extensive damage occurs.<br><br>Avoid impacts to archaeological materials. | ▪ A pre-construction archaeological survey must be undertaken.<br>▪ Ensure that infrastructure is microsited prior to construction. | ▪ Monitor that this has been considered in the design and planning phase of the operation. | ▪ Once off during the design phase | ▪ Project Developer |
| • Damage or destruction of archaeological sites or graves | Avoid impacts to kraal at waypoint 208 | ▪ Plan access road to avoid kraal at waypoint 208 and widen as little as possible.<br>▪ Any road widening that occurs must not impact on the walling (enough space must be allowed for large loads to easily pass by without hitting the wall).<br>▪ Retain fence to southwest of road if possible. | ▪ Monitor that this has been considered in the design and planning phase of the operation. | ▪ Once off during the design phase | ▪ Project Developer |
| • Intrusion to cultural landscape | Minimise signage.<br>Minimise contrast and light pollution | ▪ Signage to be modest and no higher-than-normal road signage.<br>▪ Consider painting buildings in earthy colours to reduce contrast. | ▪ Monitor that this has been considered in the design and planning phase of the operation. | ▪ Once off during the design phase | ▪ Project Developer |
| **A.7. SOCIO-ECONOMIC IMPACTS** | | | | | |
| • Creation of local employment, training, and business opportunities and impact of construction workers on local communities | Maximise potential job creation and business opportunities for locals | ▪ Preparation and implementation of a Stakeholder Engagement Plan (SEP) prior to and during the construction phase.<br>▪ Where reasonable and practical, the proponent should appoint local contractors and implement a 'locals first' policy, especially for semi and low-skilled job categories. However, due to the low skills levels in the area, the majority of skilled posts are likely to be filled by people | ▪ Ensure that a SEP has been implemented.<br>▪ Review the labour and contractor policy.<br>▪ Review the labour and contractor policy to ensure that contractors are BBBEE compliant.<br>▪ Ensure that a meeting with the Beaufort West Local Municipality | ▪ Once-off during the planning and design phase.<br>▪ Ongoing<br>▪ Ongoing<br>▪ Update as required<br>▪ Once off<br>▪ Ongoing<br>▪ As required | ▪ Holder of EA |

| Impact | Mitigation/ Management Outcomes | Mitigation/Management Actions | Monitoring | | |
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| | | from outside the area.<br>▪ Where feasible, efforts should be made to employ local contactors that are compliant with Broad Based Black Economic Empowerment (BBBEE) criteria.<br>▪ Before the construction phase commences (i.e., during the planning phase), the proponent should meet with representatives from the Beaufort West Local Municipality to establish the existence of a skills database for the area. If such as database exists, it should be made available to the contractors appointed for the construction phase.<br>▪ Where feasible, training and skills development programmes for locals should be initiated prior to the initiation of the construction phase.<br>▪ The recruitment selection process should seek to promote gender equality and the employment of women wherever possible.<br>▪ The proponent should liaise with the Beaufort West Local Municipality with regards the establishment of a database of local companies, specifically BBBEE companies, which qualify as potential service providers (e.g., construction companies, catering companies, waste collection companies, security companies etc.) prior to the commencement of the tender process for construction service providers. These companies should be notified of the tender process and invited to bid for project-related work. | was held. Keep meeting minutes on file.<br>▪ Verify that training and skills development programmes have been created/ implemented.<br>▪ Verify that the recruitment process promotes gender equality.<br>▪ Ensure that a meeting with the Beaufort West Local Municipality was held. Keep meeting minutes on file. | | |
| **A.7. IMPACTS RESULTING FROM THE BATTERY ENERGY STORAGE SYSTEMS (BESS)** | | | | | |
| • Safety, health and environmental impacts as a result of the Solid State Lithium Ion Battery Energy | Minimise the safety, health and environmental risks associated with the BESS | ▪ Consider the findings and recommendations of the High-Level Safety, Health and Environment Risk Assessment compiled for the BESS. Refer to Appendix D of this EMPr for a detailed | ▪ Conduct audits to verify if the preventative and mitigation measures have been considered and implemented, where | ▪ As required during the design phase.<br>▪ Once off<br>▪ Once off | ▪ Project Developer and ECO |

| Impact | Mitigation/ Management Outcomes | Mitigation/Management Actions | Monitoring | | |
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| Storage System (BESS) and Redox Flow BESS | | list of preventative and mitigation measures for the BESS.<br>▪ Confirm the quantity of dangerous goods in containers that will need to be stored within the facility footprint.<br>▪ Compile an End-of-Life Plan so that it is place before the first electrolyte/ container/ equipment is brought onto site.<br>▪ Investigate alternatives for and confirm the preferred alternative for the disposal of batteries prior to the installation of the BESS. | relevant and required, during the design phase. Report any non-compliance.<br>▪ Ensure that the quantity of dangerous goods in containers has been confirmed.<br>▪ Conduct and audit to verify that an End-of-Life Plan is in place prior to the arrival of the BESS.<br>▪ Conduct an audit to verify that battery disposal alternatives have been investigated and confirmed. | ▪ Once off | |
| **A.8. GEOHYDROLOGICAL IMPACTS** | | | | | |
| **Note from the CSIR: As a first option, water required for the construction, operational and decommissioning phases for of the proposed project will preferably be sourced from a borehole drilled on site, which will be subject to complete geohydrological testing and the necessary water use authorisation obtained (as applicable). The assessment further confirms that should ground water, if used, should be monitored (i.e., abstraction volumes, quality and water levels) and that this should ideally be implemented one year prior to the start of construction if the project timeframes permit. As a second option, water will be sourced from the Ubuntu Local Municipality. The project Applicant will consult with the Local Municipality and specific arrangements for water to either be trucked in, or otherwise made available for collection at their Water Treatment Plant via a metered standpipe. These arrangements will be agreed on in a Service Level Agreement (SLA). The recommendations in this section only apply if groundwater will be used for the project.** | | | | | |
| • Lowering of groundwater levels as a result of over-abstraction | Avoid over-abstraction of groundwater resources. | ▪ Monitoring of abstracted volumes, this would allow for the determination of the cumulative abstraction across each of the Farm portions and boreholes to be made. This can be achieved using flow meters.<br>▪ Monitoring of groundwater levels, to evaluate the response of groundwater abstraction on the water table. This was be conducted manually or using telemetry systems.<br>▪ Monitoring of general field chemistry, e.g. pH, EC and temperature. However, during the construction period, the analysis and sample collection should include SANS 241 analysis for one year before and after the construction period – if the project schedule allows. | ▪ Ensure that the monitoring of abstracted volumes taken into consideration and that a Geohydrology Specialist with suitable qualifications and experience is appointed to undertake relevant tests by reviewing signed minutes of meetings or signed reports or the appointment letter.<br>▪ Ensure that the borehole parameters are documented to ensure trends and consumption can be monitored.<br>▪ Undertake an audit to verify if the monitoring programme is being | ▪ Once off during the design phase<br>▪ Quarterly | ▪ Project Developer<br>▪ Hydrologist<br>▪ ECO |

| Impact | Mitigation/ Management Outcomes | Mitigation/Management Actions | Monitoring | | |
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| | | | implemented. | | |
| • Potential impact on groundwater quality as a result of accidental oil spillages or fuel leakages | Minimise the potential of groundwater contamination | ▪ Vehicles must be regularly serviced and maintained to check and ensure there are no leakages.<br>▪ A designated area should be established at the construction site camp for the purpose of vehicle servicing.<br>▪ Any engines that stand in one place for an excessive length of time must have drip trays.<br>▪ Diesel fuel storage tanks should be above ground on an impermeable concrete surface in a bunded area.<br>▪ Construction vehicles and equipment should also be refuelled on an impermeable surface. A designated area should be established at the construction site camp for this purpose, if off-site refuelling is not possible.<br>▪ If spillages occur, they should be contained and removed as rapidly as possible, with correct disposal procedures of the spilled material, and reported.<br>▪ Proof of disposal (waste disposal slips or waybills) should be obtained and retained on file for auditing purposes.<br>▪ Biodegradable cleaning agents should be selected for cleaning Solar PV panels | ▪ Ensure that vehicles are regularly serviced is taken into consideration in the design.<br>▪ Verify that a designated vehicle serving area has been established.<br>▪ Verify the presence of drip trays via an inspection.<br>▪ Verify the storage location of diesel fuel tanks via an inspection.<br>▪ Conduct an audit to review the spillage and disposal procedure.<br>▪ Confirm whether biodegradable cleaning agents are being used via an inspection. | ▪ Ongoing<br>▪ Once off<br>▪ Monthly<br>▪ Monthly<br>▪ Quarterly<br>▪ Monthly | ▪ Project Developer<br>▪ ECO |
| **A.9. GEOTECHNICAL IMPACTS** | | | | | |
| • Displacement of geologic material | Manage displacement of geological materials, and thus disturbance of existing soil conditions, impact on vegetation and potential soil erosion. | ▪ Stormwater Management Plan (SWMP) must be developed in the pre-construction phase by a qualified professional. It should detail the stormwater structures and management interventions that must preferably be installed to manage the increase of surface water flows directly into any natural systems, where possible and lawful (in consultation with suitably qualified professionals). Effective | ▪ Ensure that the development of a SWMP is taken into consideration during the design phase by appointing the relevant specialists, and reviewing the signed-off SWMP and detailed designs. | ▪ Once off prior to construction | ▪ Project Developer and Specialist |

| Impact | Mitigation/ Management Outcomes | Mitigation/Management Actions | Monitoring | | |
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| | | stormwater management must include effective stabilisation (e.g., gabions and Reno mattresses) of exposed soil.<br>▪ Ensure that the design allows for suitable stormwater management systems to be installed along roads and other areas in order to divert water away from zones where the solar infrastructure is to be constructed. Drainage systems should be designed by an appropriately qualified professional. Drainage in the region should be designed appropriately. | | | |
| | | ▪ Investigate and confirm the geotechnical suitability of each structure (or other appropriate level of investigation) prior to construction (i.e., determine that soil with an adequate bearing capacity is obtained beneath each footing).<br>▪ The seismicity in the region should be considered during design.<br>▪ Favour dolerite as an aggregate (as opposed to Karoo sandstones and mudstones). Subject to investigation.<br>▪ Any road cuttings should be designed by and appropriately qualified professional. | ▪ Ensure that the suitability of each structure is taken into consideration during the design phase by appointing the relevant specialists and contractors, and reviewing the signed off geotechnical reports and designs. | ▪ Once off prior to construction | ▪ Project Developer, Contractor and Specialist |
| • Contamination of geologic materials | To minimize the contamination of geologic materials caused by spillages/leakages | ▪ Suitably designed bunding structures, double containment and leak detection to be implemented at the BESS to mitigate potential electrolyte spillage. It is recommended that the design should be approved by a qualified professional. | ▪ Ensure that Suitably designed bunding structures, double containment and leak detection is taken into consideration during the design phase. | ▪ Once off prior to construction | ▪ Project Developer |

## 10.2 CONSTRUCTION PHASE

| B. CONSTRUCTION PHASE |
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| **B.1. AGRICULTURE AND SOILS IMPACTS** | | | | | |
| • Erosion | That disturbance and existence of hard surfaces causes no erosion on or downstream of the site.<br><br>That vegetation clearing does not pose a high erosion risk | ▪ Implement an effective system of stormwater run-off control, where it is required - that is at any points where run-off water might accumulate. The system must effectively collect and safely disseminate any run-off water from all accumulation points and it must prevent any potential down slope erosion.<br>▪ Maintain where possible all vegetation cover and facilitate re-vegetation of denuded areas throughout the site, to stabilize disturbed soil against erosion. | ▪ Undertake a periodic site inspection to verify and inspect the effectiveness and integrity of the stormwater run-off control system and to specifically record the occurrence of any erosion on site or downstream. Corrective action must be implemented to the run-off control system in the event of any erosion occurring.<br>▪ Undertake a periodic site inspection to record the occurrence of and re-vegetation progress of all areas that require re-vegetation. | ▪ Every 2 months during the construction phase | ▪ ECO |
| • Topsoil loss | That topsoil loss is minimised | ▪ If an activity will mechanically disturb the soil below surface in any way, then any available topsoil should first be stripped from the entire surface to be disturbed and stockpiled for re-spreading during rehabilitation. During rehabilitation, the stockpiled topsoil must be evenly spread over the entire disturbed surface.<br>▪ Separate the upper 20cm of topsoil from the rest of the excavation phase and store it in a separate stockpile. The topsoil must be backfilled last, so that it remains on the surface. | ▪ Record GPS positions of all significant occurrences (that is an area of greater than 25 square metres) of below-surface soil disturbance (e.g., excavations). Record the date of topsoil stripping, quantity and replacement. Check that topsoil covers the entire disturbed area and is not all utilised for the first areas to be rehabilitated within the site. | ▪ As required, whenever areas are disturbed. | ▪ ECO |
| **B.2. VISUAL IMPACTS** | | | | | |
| • Large construction vehicles and equipment will alter the natural character of the study area and expose visual receptors to impacts associated with construction.<br>• Construction activities may be perceived as an | Minimise exposure of visual receptors to visual impacts. | ▪ Carefully plan to minimise the construction period and avoid construction delays.<br>▪ Restrict construction activities to daylight hours in order to negate or reduce the visual impacts associated with lighting.<br>▪ Minimise vegetation clearing and rehabilitate cleared areas as soon as possible.<br>▪ Vegetation clearing should take place in a phased manner. | ▪ Conduct site inspections to monitor implementation and report on non-compliances and areas where visual aspects could be improved upon. | ▪ Monthly | ▪ Contractor<br>▪ ECO |

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| unwelcome visual intrusion, particularly in more natural undisturbed settings.<br>• Dust emissions and dust plumes from increased traffic on the gravel roads serving the construction site may evoke negative sentiments from surrounding viewers.<br>• Surface disturbance during construction would expose bare soil (scarring) which could visually contrast with the surrounding environment.<br>• Temporary stockpiling of soil during construction may alter the flat landscape. Wind blowing over these disturbed areas could result in dust which would have a visual impact.<br>• Litter on the construction site may result in visual pollution. | | ▪ Inform any receptors within 500 m of the site of the construction programme and schedules.<br>▪ Make use of existing gravel access roads where possible.<br>▪ Limit the number of vehicles and trucks travelling to and from the proposed sites, where possible.<br>▪ Ensure that suitable dust suppression techniques are implemented:<br>o on all access roads;<br>o in all areas where vegetation clearing has taken place;<br>o on all soil stockpiles.<br>▪ Maintain a neat construction site by removing litter, rubble and waste materials regularly. | | | |
| **B.3. HERITAGE IMPACTS (ARCHAEOLOGY AND CULTURAL LANDSCAPE)** | | | | | |
| • Damage or destruction of archaeological sites, buildings, or graves | ▪ Rescue information, artefacts or burials before extensive damage occurs.<br>▪ Avoid impacts to archaeological materials. | ▪ Reporting chance finds of graves and dense clusters of artefacts as early as possible to the South African Heritage Resources Agency (SAHRA) (https://www.sahra.org.za/contact/), protect in situ and stop work in immediate area and appoint archaeologist to exhume or sample as needed (where relevant). Such heritage finds are the property of the state and may require excavation and curation in an approved institution. | ▪ Inform staff to be vigilant and carry out inspections of all new excavations.<br>▪ Ensure that the Chance Fossil Finds Protocol is taken into consideration during chance finds or when required during the construction phase. A copy of the contact details of the relevant HWC officials must be kept on | ▪ At the initiation of construction and thereafter as needed.<br>▪ Whenever on site (at least weekly) | ▪ Holder of the EA Contractor and ECO |

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| | | | file at the site office at all times. The Contractor must be aware of such details and requirements. | | |
| • Intrusion of solar facility and equipment into the landscape | Minimise the impacts of the solar facility and equipment on the landscape | ▪ Minimise duration of construction period<br>▪ Ensure disturbance is kept to a minimum and does not exceed project requirements.<br>▪ Ensure effective rehabilitation of areas disturbed by construction activities which are not needed during operation.<br>▪ Minimise signage.<br>▪ Signage demarcating the entrance of the facility must be modest in nature and should not exceed the height of regular street signage.<br>▪ Lighting mitigation must be employed to ensure that light is directed only to where it is needed and, preferably, that it only switches on when needed | ▪ Monitor cut and fill activities.<br>▪ Monitor surface clearance relative to approved layout<br>▪ Monitor the rehabilitation process.<br>▪ Ensure that signage is modest and no higher than road signage. | ▪ When on site (at least weekly)<br>▪ When on site (at least weekly)<br>▪ When on site (at least weekly)<br>▪ Once off | ▪ Construction Manager or Contractor<br>▪ ECO |
| • Damage or destruction of any known sites | Avoid impacts | ▪ Place No-go signage at identified sensitive locations (waypoints 208 and 214)<br>▪ No stones may be removed from any archaeological site (with the exception of waypoint 213 if it cannot be preserved).<br>▪ Access road to avoid kraal at waypoint 208 and widen as little as possible.<br>▪ Any road widening that occurs must not impact on the walling (enough space must be allowed for large loads to easily pass by without hitting the wall).<br>▪ Retain fence to southwest of road if possible. | ▪ Monitor No-Go areas (construction period only). | ▪ Once off<br>▪ When on site (at least weekly) | ▪ Construction Manager or Contractor |
| **B.4. PALAEONTOLOGY IMPACTS** | | | | | |
| • Loss of Fossil Heritage Disturbance/damage and destruction of fossils at/below surface | Safeguarding, recording, and sampling of palaeontological materials encountered or exposed during construction (Chance Fossil Finds) | ▪ Implement the chance find protocol.<br>▪ Significant fossil finds should be safeguarded and reported as soon as possible to the South African Heritage Resources Agency (SAHRA) (Contact details: 111 Harrington Street, Cape Town, 8001. PO Box 4637, Cape Town, 8000. Tel: 021 462 4502. Fax: 021 462 4509. Email: info@sahra.org.za).<br>▪ Before any fossil material can be collected | ▪ Ensure that the Chance Fossil Finds Protocol is implemented if any fossiliferous deposits are exposed or during chance fossil finds. Undertake inspections and report any non-compliance.<br>▪ Regular visual inspection of substantial excavations ( > 1 m) and cleared areas for fossil | ▪ Ongoing during the construction phase | ▪ ECO<br>▪ Contractor<br>▪ Appointed palaeontologist |

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| | | from the development site, the specialist involved would need to apply for a collection permit from SAHRA. Fossil material must be housed in an official collection (museum or university), while all reports and fieldwork should meet the minimum standards for palaeontological impact studies proposed by SAHRA (2012). | remains.<br>▪ The immediate area of the fossil find must be safeguarded with security tape / fence / sand bags if necessary. | | |
| **B.5. TERRESTRIAL AND AQUATIC BIODIVERSITY AND SPECIES IMPACTS** | | | | | |
| • Loss of aquatic / terrestrial species of special concern (SSC) | To reduce the loss of and impact on aquatic species and SSC | ▪ A preconstruction walkdown must be conducted to identify any areas that may contain any aquatic SSC so that these can be demarcated and avoided in the final design process.<br>▪ Any remaining species that could not be avoided must then be relocated in a Search and Rescue programme that should be initiated prior to construction. | ▪ The Applicant must ensure that a suitable aquatic / terrestrial ecologist is appointed to undertake a final walk-through of the final approved site prior to commencement of construction to identify SCC requiring Search and Rescue or avoidance. The specialist shall also assist with micrositing of the facilities' boundary, compilation of the SWMP.<br>▪ Monitor activities and record and report non-compliance.<br>▪ Apply for relevant permits with relevant authorities.<br>▪ Strict control over the behaviour of construction workers, restricting activities to within demarcated areas for construction.<br>▪ ECO must monitor activities and record and report non-compliance.<br>▪ Strict control and proper education of staff to prevent misconduct. If ECO is absent, there should be a designated Environmental Officer (EO) present to deal with any urgent issues. | ▪ Once-off prior to the commencement of construction<br>▪ Daily during periods of river flow during construction<br>▪ Monthly during the construction phase<br>▪ Monthly for 6 months post construction and where any unstable soils occur, these must be protected with temporary stabilisation dependent on the scale of the impact i.e. sand bags - hay bales) until areas become revegetated. If any areas require permanent erosion protection (e.g. gabions or stone pitching) then the GA must be amended to include these areas.<br>▪ Weekly<br>▪ As needed. | ▪ Project Applicant<br>▪ Contractor<br>▪ ECO/ EO |
| • Loss of ecosystem services, and or habitats that would result in habitat | ▪ Prevent the loss of ecosystem services and habitat fragmentation | ▪ Rapid regeneration of plant cover must be encouraged by setting aside topsoil during earthmoving and replacing onto areas where | ▪ Inspect whether topsoil is being set aside for use in areas that are required . to ensure that habitats | ▪ As needed during earthmoving activities | ▪ ECO<br>▪ Contractor |

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| fragmentation, especially those included in any biodiversity conservation plans as Critical Biodiversity areas or Ecological Support Areas. This in turn could also lead to habitat fragmentation. | | the re- establishment of plant cover is desirable to prevent erosion, ensure habitats are not fragmented and ecological support is maintained. | are not fragmented, and ecological support is maintained. | | |
| • Damage or loss of riparian and riverine systems and disturbance of the waterbodies in the construction phase | To reduce the loss of and impact on aquatic ecosystems | ▪ A pre-construction walkthrough by an aquatic specialist is recommended so they can assist with the development of the Stormwater Management Plan (SWMP) and Aquatic Construction Rehabilitation and Monitoring Plan, coupled to micro-siting of the final layout.<br>▪ Suitable stormwater management systems must be installed along roads and other areas and monitored during the first few months of use. Any erosion / sedimentation must be resolved through whatever additional interventions maybe necessary (i.e., extension, energy dissipaters, spreaders, etc).<br>▪ Furthermore, the following applies to watercourse crossing upgrades associated with the proposed development:<br>○ All pipe culverts must be removed and replaced with suitable sized box culverts, where road levels are raised.<br>○ River levels, regardless of the current state of the river / water course will be reinstated thus preventing any impoundments from being formed. The related designs must be assessed by an aquatic specialist during a pre-construction walkdown.<br>○ Where large cut and fill areas are required, these must be stabilised and rehabilitated during the construction process, to minimise erosion and sedimentation.<br>○ Monitoring<br>▪ All alien plant re-growth, which is currently low within the greater region must be monitored and should it occur, these plants must be eradicated within the project footprints and | ▪ Project Developer must ensure that a suitable terrestrial ecologist is appointed to undertake a final walk-through of the final approved site prior to commencement of construction to identify SCC requiring Search and Rescue or avoidance.<br>▪ Monitor activities and record and report non-compliance.<br>▪ Apply for relevant permits with relevant authorities.<br>▪ Strict control over the behaviour of construction workers, restricting activities to within demarcated areas for construction.<br>▪ ECO must monitor activities and record and report non-compliance.<br>▪ Strict control and proper education of staff to prevent misconduct. If ECO is absent, there should be a designated Environmental Officer (EO) present to deal with any urgent issues. | ▪ Daily during periods of river flow during construction<br>▪ Monthly during the construction phase<br>▪ Monthly for 6 months post construction and where any unstable soils occur, these must be protected with temporary stabilisation dependent on the scale of the impact i.e. sand bags - hay bales) until areas become revegetated. If any areas require permanent erosion protection (e.g. gabions or stone pitching) then the GA must be amended to include these areas. | ▪ Contractor<br>▪ ECO |

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| | | especially in areas near the proposed crossings. | | | |
| • Impact on localised surface water quality (Spills and leaks from construction vehicles / machinery when working in or near the delineated systems) | Avoid, prevent and minimise the impact on water quality | ▪ All liquid chemicals including fuels and oil, including for the BESS, must be stored in with secondary containment (bunds or containers or berms) that can contain a leak or spill. Such facilities must be inspected routinely and must have the suitable PPE and spill kits needed to contain likely worst-case scenario leak or spill in that facility, safely.<br>▪ Washing and cleaning of equipment must be done in designated wash bays, where rinse water is contained in evaporation/sedimentation ponds (to capture oils, grease cement and sediment).<br>▪ Mechanical plant and bowsers must not be refuelled or serviced within 100m of a river channel.<br>▪ All construction camps, laydown areas, wash bays, batching plants or areas and any stores should be more than 50m from any demarcated water courses.<br>▪ Littering and contamination associated with construction activity must be avoided through effective construction camp management.<br>▪ No stockpiling should take place within or near a water course.<br>▪ All stockpiles must be protected and located in flat areas where run-off will be minimised and sediment recoverable. | ▪ Strict control over the behaviour of construction workers, restricting activities to within demarcated areas for construction.<br>▪ ECO must monitor activities and record and report non-compliance.<br>▪ Strict control and proper education of staff to prevent misconduct. If ECO is absent, there should be a designated Environmental Officer (EO) present to deal with any urgent issues. | ▪ Daily during periods of river flow during construction<br>▪ Monthly during the construction phase<br>▪ Monthly for 6 months post construction and where any unstable soils occur, these must be protected with temporary stabilisation dependent on the scale of the impact i.e. sand bags - hay bales) until areas become revegetated. If any areas require permanent erosion protection (e.g. gabions or stone pitching) then the GA must be amended to include these areas. | ▪ Contractor<br>▪ ECO |
| • Loss of natural vegetation in and outside development footprint area and veld degradation. | Reduced loss of natural vegetation and veld degradation within the development footprint and the surrounding area. | ▪ Sensitive habitats and areas outside of the project development area should be clearly demarcated as No-go areas during the construction phase to avoid accidental impacts.<br>▪ Vegetation clearing close to the watercourse should be minimised and where necessary, appropriate storm water management should be put in place to limit erosion potential of exposed soil, such as placing sedimentation trapping to prevent exposed soils from spilling into the watercourse (if necessary).<br>▪ The watercourse and its buffer areas should | ▪ Strict control over the behaviour of construction workers, restricting activities to within demarcated areas for construction and out of No-go areas.<br>▪ ECO must monitor activities and record and report non-compliance.<br>▪ Strict control and proper education of staff to prevent misconduct. If ECO is absent, there should be a designated | • Daily | • Contractor<br>• ECO |

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| | | be demarcated and fenced off prior to construction to exclude the watercourse from development activities.<br>▪ Workers should not be allowed outside the demarcated construction areas or camps or beyond the boundaries of the solar PV facility itself, i.e. they will not be allowed to wander across the undeveloped parts of each site. No development or activities should take place in the high sensitivity areas. These areas should be declared No-go areas (i.e. areas where no development of any infrastructure is allowed, including associated infrastructure).<br>▪ Buffer zones are allocated to sensitive or important habitat features to alleviate the effect of habitat loss, habitat fragmentation, disturbances, increased isolation and edge effects. No development should take place within High sensitivity areas or buffer zones.<br>▪ No construction related activities, such as the site camp, storage of materials, temporary roads or ablution facilities may be located in the high sensitivity areas.<br>▪ Minimise loss of natural vegetation.<br>▪ Only clear areas designated for development. | Environmental Officer (EO) present to deal with any urgent issues. | | |
| | | ▪ The proposed project footprint must be demarcated to reduce unnecessary disturbance beyond the proposed project area | ▪ Carry out visual inspections to ensure strict control over the behaviour of staff in order to restrict activities to within demarcated areas. | • Weekly | • ECO |
| | | ▪ Unnecessary impacts on surrounding natural vegetation must be avoided during construction. No construction vehicles should be allowed to drive around the veld. All construction vehicles should strictly remain on properly demarcated roads. | • Strict control over the behaviour of construction workers, restricting activities to within demarcated areas for construction.<br>▪ Include periodical site inspection in environmental performance reporting that specifically records occurrence or not of off-road vehicle tracks in specific areas. | • Daily | • Contractor<br>• ECO |

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| | | ▪ Undertake re-vegetation and rehabilitation of disturbed areas as soon as possible after construction. Stockpile all vegetation that needs to be removed and safely store on site until required. Stockpile the shallow topsoil layer separately from the subsoil layers. Reinstate the topsoil layers (containing seed and vegetative material) when construction is complete to allow the plants to rapidly re-colonise the bare soil areas. Mulch and spread the mulched vegetation that was collected on site, as a thin layer of mulch throughout areas being rehabilitated. Re-seed with locally-sourced seed of indigenous grass species that were recorded on site during the pre-construction phase. | ▪ Undertake audits following the construction phase and report any non-compliance with respect to re-vegetation and rehabilitation. | • Daily | • Contractor<br>• ECO |
| | | • The collection, hunting or harvesting of any plants (or 'veldkos'), fuel wood or animals at the site during construction should be strictly forbidden and the staff should be educated to prevent this from happening.<br>▪ Indigenous vegetation must not be removed or damaged. | • Strict control over the behaviour of construction workers, restricting activities to within demarcated areas for construction.<br>• Carry out Environmental Awareness Training.<br>• Conduct audits of the signed attendance registers.<br>• Issue fines where relevant as per specifications in their contracts.<br>▪ Ensure that environmental awareness programmes are implemented. | • Once-off training and ensure that all new staff is inducted.<br>Weekly during construction phase. | Contractor<br>ECO |
| | | • Fires should only be allowed within fire-safe demarcated areas. Open fires must be prohibited. Appropriate fire safety training should also be provided to staff that are to be on site for the duration of the construction phase. | • Strict control over the behaviour of construction workers, restricting activities to within demarcated areas.<br>▪ Ensure fire safety requirements are well. understood and respected by workers (by providing basic fire safety training). | • Daily | • Contractor<br>• ECO |
| • Disturbance of terrestrial | To advise construction staff | ▪ Establish a recording method in order to | • Establish database of species, | • Daily to weekly | • ECO |

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| fauna and flora on site due to construction workers and activities, including the impact of littering and pollution | of the requirements in respect of management of flora and fauna on site during the construction phase.<br><br>Minimise the disturbance to flora and fauna in the surrounding area as a result of littering and pollution.<br><br>Reduce the amount of littering and pollution within and around the construction site | monitor the construction activities, including species presence within site, mortalities and observations. | observations, conditions, impacts etc.<br>• Construction personnel should advise on the findings and presence of fauna on site. | | |
| | | ▪ All staff should be subjected to an induction training program where appropriate conservation principles, safety procedures, snake bite avoidance and first aid treatment are taught. Several staff members should complete a snake handling course to safely remove snakes from construction areas. At all times there should be a sufficient number of qualified staff available on site to relocate fauna.<br>▪ All staff operating motor vehicles must undergo an environmental induction training course that includes instruction on the need to comply with speed limits, to respect all forms of wildlife (especially reptiles and amphibians) and, wherever possible, prevent accidental road kills of fauna. Drivers not complying with speed limits should be subject to penalties. | • Hold induction training programs as specified. All new staff should be inducted. Attendance registers should be monitored and kept on file.<br>• Selected staff should attend a recognised snake handling course and be appointed as snake handlers.<br>• Sufficient snake handling equipment to be appropriately stored on site.<br>• Verify that penalties are enforced during non-compliance by undertaken audits and inspections. | • As required | • Contractor<br>• ECO |
| | | • Excavated trenches and holes must be left open for as short a time as possible to avoid acting as dispersal barriers or traps.<br>• All open excavated trenches and deep holes must have escape points with an angle of less than 45° to allow for trapped animals to escape. | • Conduct visual inspections to verify compliance and report any non-compliance. | • Weekly | • Contractor<br>• ECO |
| | | • Equipment with low noise emissions must be used to not disrupt ecological life cycles (breeding, migration, feeding) of animals. Do not unnecessarily disturb faunal species, especially during the breeding season and juveniles. | • Conduct visual inspections to verify compliance and report any non-compliance. | • Weekly | • Contractor<br>• ECO |
| | | • The site camp must not be located in high sensitivity areas and their buffer zones.<br>• Ablution facilities must be located outside sensitive areas and their buffer zones. | • Monitor the placement of the site camp, ablution facilities and dangerous goods via visual inspections, and record and | • Once-off prior to construction and as required during the construction phase. | • ECO |

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| | | • Dangerous goods may not be stored within 100 m of a watercourse. | report any non-compliance. | | |
| | | ▪ Sufficient waste disposal bins must be available on site and clearly marked. Skip bins may be required during the construction phase which must be emptied on a regular basis by an approved/licenced waste disposal contractor. Proof of disposal to be kept on file. | • Monitor general waste generation by construction staff and collection, as well as the provision of bins and/or skips via audits throughout the construction phase.<br>• Monitor the handling of general waste on site via site audits and record non-compliance and incidents.<br>• Monitor waste disposal slips and waybills via site audits and record non-compliance and incidents. | • Daily or Weekly | • Contractor<br>• ECO |
| | | • Portable ablution facilities must be regularly cleaned and maintained in good working condition.<br>• Any spillage from ablution facilities must be cleaned up immediately and disposed of in an appropriate manner. | • Conduct visual inspections to verify that portable ablution facilities are cleaned and maintained regularly,and report any non-compliance.<br>• Monitor if spillages have taken place and if so, are removed immediately and correctly. Monitor waste disposal slips and waybills via site audits and record non-compliance and incidents. | • Daily<br>• During spills | • ECO |
| | | • Hydrocarbon fuels must be stored in a secure, bunded area.<br>• Vehicles must be in good working condition, with no oil, water, or fuel leaks. Vehicles must be regularly inspected, and any problems corrected.<br>• Refuelling may only take place in an appropriate, bunded area. Refuelling may not take place in sensitive areas.<br>• Hydrocarbon spills must be contained and cleaned up immediately. Spill kits must be available on site in case of accidental spillage. | • Monitor the storage and handling of dangerous goods and hazardous materials on site via site audits and record non-compliance and incidents.<br>• Undertake visual inspections to ensure that vehicles are in good working condition with no leaks, and that they are regularly serviced. Record non-compliance and incidents<br>• Monitor the refuelling process | • Weekly | • Contractor<br>• ECO |

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| | | | and its location and record the occurrence of any spillages.<br>• Monitor if spillages have taken place and if they are removed correctly. | | |
| • Increased erosion and soil compaction | Reduced erosion and soil compaction caused by construction activities | • Utilise existing access routes as far as possible.<br>• Confine the movement of vehicles to the access routes to and from the site and to the construction areas.<br>• Do not drive in the natural veld. | • Construction access roads must be demarcated clearly. Undertake site inspections to verify.<br>• Strict control over the behaviour of construction workers, restricting activities to within demarcated areas for construction.<br>• Include periodic site inspection in environmental performance reporting that specifically records occurrence or not of off-road vehicle tracks in specific areas. | • Weekly | • Contractor<br>• ECO |
| | | • Rehabilitate new vehicle tracks and areas where the soil has been compacted as soon as possible.<br>• Monitor the entire site for signs of erosion. | • Ensure that the rehabilitation of new vehicle tracks is taken into consideration during the construction and record any non-compliance.<br>• Undertake regular monitoring for erosion to ensure is reduced and rectified as soon as possible. | • Weekly | • Contractor<br>• ECO |
| • Faunal road mortality as a result of increased vehicles travelling to and within the site. | Minimise loss of fauna as a result of road mortalities. | • To ensure that animals are not attracted to the site (and potentially resulting in increased road mortality), the waste collection bins and skips should be covered with suitable material, where appropriate, and the site camp must be kept clean on a daily basis. | • Monitor the activities via visual inspections, and record and report any non-compliance. | • Daily | • Contractor<br>• ECO |
| | | • All vehicle speeds associated with the project should be monitored and should be limited to 40 km/h (maximum) during the construction phase.<br>• Conduct inspections of the fence line to address any animals that may be affected by | • Carry out Environmental Awareness Training.<br>• Conduct audits of the signed attendance registers.<br>• Conduct weekly inspections of | • Once-off training and ensure that all new staff are inducted.<br>• Monthly.<br>Weekly record keeping. A register of all faunal | Project developer<br>Contractor<br>ECO |

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| | | the fence, i.e. stuck or casualties. | the fence line to address any animals that may be affected by the fence. | sightings indicating date of siting; species affected; position of species (specific or indicative) and other observations should be established. | |
| | | • A roadkill monitoring programme (inclusive of wildlife collisions record keeping) should be established. Where needed, Animex fences must be installed to direct animals to safe road crossings. Finally, mitigation should be adaptable to the onsite situation which may vary over time. | ▪ Appropriate monitoring should be undertaken. | ▪ Weekly | ▪ Contractor<br>▪ ECO |
| • Impact and loss of fauna as a result of the fence line and exclusion of fauna from site resulting in ecological change within the site | To reduce incidental mortality and injury of fauna within the construction area. | • Conduct inspections of the fence line to address any animals that may be affected by the fence, i.e. stuck or casualties. | • As above (refer to the last point above) | • As above (refer to the last point above) | • Project developer<br>• ECO |
| • Loss of vegetation by increased degradation and reduced ecosystem services | Rehabilitation post-construction by replacing topsoil, mulching with chipped vegetation and re-seeding.<br>Refer to vegetation type for list of dominant species. | • Re-vegetation of disturbed surfaces must occur immediately after construction activities are completed. If vegetation needs to be removed from areas within the site this should be safely stockpiled and mulched/ chipped prior to being used for revegetation and rehabilitation purposes. Allow natural vegetation recruitment from the topsoil unless the vegetation cover is insufficient. Re-seed with locally sourced seed of indigenous grass species that were recorded on site pre-construction or by using a commercial seed mix indigenous to the area. | • Compare vegetation establishment on rehabilitated areas to surrounding natural vegetation.<br>• Rehabilitate the following areas:<br>- Road verges after road construction is completed.<br>- Transformed portions of the site not developed.<br>- Areas where alien invasive species have been removed and have left bare soil.<br>• A list of indigenous plants used during rehabilitation must be approved by the ECO prior to commencement of rehabilitation activities. | • As recommended by the specialist / ECO | • Appointed Botanist<br>• ECO |
| **B.7. AVIFAUNA IMPACTS** | | | | | |

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| • Disturbance and displacement of avifauna<br>• Habitat loss and displacement | Prevent unnecessary displacement of avifauna by ensuring that contractors are aware of the requirements of the Construction Environmental Management Programme (CEMPr.) | ▪ A site-specific CEMPr must be implemented, which gives an appropriate and detailed description of how construction activities must be conducted. All contractors are to adhere to the CEMPr and should apply good environmental practice during construction. The CEMPr must specifically include the following:<br>o No off-road driving;<br>o Maximum use of existing roads, where possible and the construction of new roads should be kept to a minimum as far as practical;<br>o Measures to control noise and dust according to latest best practice;<br>o Restricted access to the rest of the property, the activity should as far as possible be restricted to the development footprint;<br>o Strict application of all recommendations in the ecological and botanical specialist studies, especially pertaining to the limitation of the footprint. | ▪ Implementation of the CEMPr. Oversee activities to ensure that the CEMPr is implemented and enforced via site audits and inspections. Report and record any non-compliance.<br>▪ Ensure that construction personnel are made aware of the impacts relating to off-road driving.<br>▪ Demarcate disturbance footprint during construction, to the minimum practically possible to minimise disturbance and habitat loss. All areas outside of disturbance footprint are No Go areas.<br>▪ Keep vegetation clearing within the development footprint to the minimum practically possible to minimise habitat loss. Indigenous vegetation which does not interfere with the development must be left undisturbed.<br>▪ Breeding sites of any avian species as identified by an avifaunal specialist within the disturbance footprint must be kept intact and disturbance to breeding birds must be avoided.<br>▪ Should any SCC be found breeding within the site boundary at any point during operation of the facility, the area must be cordoned off as far as practically possible, and an avifaunal specialist must be contacted<br>. | ▪ Avifaunal survey to take place prior to the construction phase<br>▪ Disturbance to be minimised throughout the construction phase and monitored on a monthly basis by the ECO | ▪ Contractor<br>▪ ECO<br>▪ Appointed avifaunal specialist |
| **B.8. SOCIO-ECONOMIC IMPACTS** | | | | | |

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| • Impacts from expenditure on the construction of the project | Maximize positive benefits associated with spending injections into the area | ▪ Setting targets for how much local labour should be used based on the needs of the Applicant and the availability of existing skills and people that are willing to undergo training. Opportunities for the training of unskilled and skilled workers from local communities should be maximized.<br>▪ Using local sub-contractors where possible and requiring that contractors from outside the local area that tender also meet targets for how many locals are given employment.<br>▪ Exploring ways to enhance local community benefits with a focus on broad-based Black Economic Empowerment (BEE) and preferential procurement.<br>▪ Setting up a skills and services database in partnership with the local municipality and civil society for the local area before any hiring or contracting decisions are made. This can help to ensure fairness and limit potential interference in hiring processes.<br>▪ An effective employee induction programme is essential to ensuring that new employees, some of whom will be unfamiliar with the responsibilities of maintaining employment, are adequately prepared and motivated to adjust to the lifestyle required of them. This programme should incorporate life skills training as well as basic financial literacy training.<br>▪ Counselling services should be made available to employees to ensure that they have adequate guidance.<br>▪ Assisting smaller enterprises where possible in tendering for contracts and in accessing finance which are common constraints to their participation in projects.<br>▪ Avoiding potential service provider decisions that may lead to abuse or local dissatisfaction. For example, only appointing one | ▪ Undertake evaluations to monitor if targets are met.<br>▪ Undertake inspections to verify if local contractors are being used (where possible).<br>▪ Undertake inspections to verify if ways to enhance local community benefits with a focus on broad-based Black Economic Empowerment (BEE) are being explored.<br>▪ Undertake inspections to verify if a database has been set up.<br>▪ Attendance registers should be monitored and kept on file of all induction sessions.<br>▪ Undertake inspections to verify if counselling services have been made available.<br>▪ Undertake inspections to verify if smaller enterprises are being assisted.<br>▪ Undertake inspections to verify if multiple service providers are being used.<br>▪ Undertake audits to avoid significant salary variations. | ▪ Annually or bi-annually<br>▪ Quarterly<br>▪ Quarterly<br>▪ Quarterly<br>▪ Quarterly<br>▪ Quarterly<br>▪ Quarterly<br>▪ Quarterly | Project Developer and ECO |

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| | | accommodating rental agent or one catering supplier may lead to local dissatisfaction regarding the spreading of project benefits.<br>▪ As far as possible, avoid significant variation in salaries between various contractors for the same types of jobs. When variations are too high, the likelihood of dissatisfaction increases. | | | |
| • Impacts associated primarily with the influx of people | Minimise the negative impacts on an influx of people | ▪ A 'locals first' policy with regards to construction labour needs.<br>▪ The community should be able to contact the site manager or their representative to report any issues which they may have. The site manager and their representative should be stationed within the area and should therefore be available on hand to deal with and address any concerns which may be raised.<br>▪ A complaints register should be available on site to any individual who may have a particular complaint with regards to the construction process.<br>▪ The Applicant and the contractors should, develop a Code of Conduct for the project. The code should identify what types of behaviour and activities by workers are not permitted in agreement with surrounding landowners and land managers. For example, access on land that is not part of the development will not be allowed.<br>▪ The Applicant and the contractor should implement a TB and HIV/AIDS awareness programme for all workers at the outset of the construction phase.<br>▪ Arrangements must be made to enable workers from outside the area to return home at reasonably regular intervals. This would reduce the risk posed by non-local construction workers to local family structures and social networks.<br>▪ Condoms should be freely available to employees and all contractor workers. | ▪ Undertake an audit to ensure that a "local first" policy has been compiled.<br>▪ Undertake inspections to verify if the site manager/ representative is contactable.<br>▪ Undertake inspections to verify if complaints register is being kept.<br>▪ Composition of workforce to be monitored during construction to assess the number of local residents employed. Review of the registers held by the contractors.<br>▪ Verify that a Code of Conduct is developed and is being implemented with written proof kept on file.<br>▪ Verify that HIV/AIDS, COVID-19, and TB awareness programme is developed, and is being implemented with written proof kept on file.<br>▪ Monitor if arrangements are being made to enable workers from outside the area to return home.<br>▪ Undertake inspections to verify if condoms are freely available.<br>▪ Verify that workers are transported to their place of residence following contract closure. | ▪ Once-off<br>▪ Monthly<br>▪ Quarterly<br>▪ Quarterly<br>▪ Quarterly<br>▪ Quarterly<br>▪ Quarterly<br>▪ Quarterly.<br>▪ As required | Project Developer and ECO |

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| | | ▪ The contractor should make the necessary arrangements for ensuring that all non-local construction workers are transported back to their place of residence once the construction phase is completed.<br>▪ Close coordination with the municipality is required, including regular meetings. | ▪ Verify that regular meetings are held with the municipality. Meeting minutes should be kept on file. | | |
| • Impacts on tourism | Minimise negative impacts on tourism | ▪ Impacts on tourism are dependent on how the site is developed and managed to minimise negative biophysical impacts. The measures recommended in other specialist reports to these impacts (primarily the minimisation of visual, heritage, traffic and ecological impacts) would thus also minimise tourism impacts. | ▪ Ensure that mitigation measures contained the EMPr are adhered to. | ▪ As required | ▪ Project Developer, Contractor, Specialists (if required) and ECO |
| • Impacts on surrounding landowners and communities | Minimise the impact of the construction activities on the surrounding landowners and communities | ▪ No construction workers, except for security personnel, should be allowed to stay on the site overnight.<br>▪ The community should be able to contact the site manager to report any issues which they may have. The site manager should be stationed within the area and should therefore be available on hand to deal with and address any concerns which may be raised.<br>▪ A complaints register should be available on site to any individual who may have a particular complaint with regards to the construction or operations processes.<br>▪ The Applicant should develop a Code of Conduct for the project. The Code should identify what types of behaviour and activities by workers are not permitted in agreement with surrounding landowners and land managers.<br>▪ The movement of workers on and off the site should be closely managed and monitored by the contractors. In this regard the contractors should be responsible for making the necessary arrangements for transporting workers to and from site on a daily basis.<br>▪ The Applicant should implement measures to assist and, if needed, fairly compensate | ▪ Security records must be reviewed to verify no personnel stay over on site. Record and report any non-compliance.<br>▪ Undertake inspections to verify if the site manager/ representative is contactable.<br>▪ Undertake inspections to verify if complaints register is being kept.<br>▪ Verify that a Code of Conduct is developed and is being implemented with written proof kept on file.<br>▪ Monitor that transport of staff to and from site is provided and report non-compliances.<br>▪ Verify if measures for compensating farmers and communities for any stock losses and/or damage to farm infrastructure linked to project construction workers. Record and report any non-compliance.<br>▪ Review EMPr to ensure that relevant information on waste | ▪ Monthly<br>▪ Monthly<br>▪ Quarterly<br>▪ Once-off<br>▪ Monthly<br>▪ Quarterly<br>▪ Once-off<br>▪ As required | ▪ Project Developer, Contractor and ECO |

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| | | potentially affected surrounding landowners whereby damages to farm property, stock theft or significant disruptions to farming activities can be minimized or reduced. Measures should be agreed on before construction commences.<br>▪ The EMPr must outline procedures for managing and storing waste on site, specifically plastic waste that poses a threat to livestock if ingested.<br>▪ Mitigation measures proposed by other specialists, in particular those prescribed in the TIA, need to be adhered to. | management is included.<br>▪ Ensure the implementation and adherence to mitigation measures proposed by other specialists. | | |
| **B.9. IMPACTS RESULTING FROM THE BATTERY ENERGY STORAGE SYSTEMS (BESS)** | | | | | |
| • Safety, health and environmental impacts as a result of the Solid State Lithium Ion Battery Energy Storage System (BESS) and Redox Flow BESS | Minimise the safety, health and environmental risks associated with the BESS | ▪ Consider the findings and recommendations of the High-Level Safety, Health and Environment Risk Assessment compiled for the BESS. Refer to Appendix D of this EMPr for a detailed list of preventative and mitigation measures for the BESS.<br>▪ Continually monitor the quantity of dangerous goods stored in containers within the facility footprint.<br>▪ Ensure that the End-of-Life Plan is in place and signed by all relevant parties prior to the first electrolyte/ container/ equipment is brought onto site.<br>▪ Confirm the disposal procedure for batteries prior to the installation of the BESS, and appoint the necessary specialist contractor (if necessary. | ▪ Conduct audits to verify if the preventative and mitigation measures have been considered and implemented, where relevant and required, during the construction phase. Report any non-compliance.<br>▪ Conduct audits to verify that the quantity of dangerous goods in containers is being monitored.<br>▪ Conduct and audit to verify that an End-of-Life Plan is in place prior and signed to the arrival of the BESS.<br>▪ Conduct an audit to verify that battery disposal procedure is in place. | ▪ Ongoing<br>▪ Ongoing<br>▪ Once off<br>▪ Once off | ▪ Project Developer, Contractor, and ECO |
| **B.10. GEOHYDROLOGICAL IMPACTS** | | | | | |
| **Note from the CSIR: As a first option, water required for the construction, operational and decommissioning phases for of the proposed project will preferably be sourced from a borehole drilled on site, which will be subject to complete geohydrological testing and the necessary water use authorisation obtained (as applicable). The assessment further confirms that should ground water, if used, should be monitored (i.e., abstraction volumes, quality and water levels) and that this should ideally be implemented one year prior to the start of construction if the project timeframes permit. As a second option, water will be sourced from the Ubuntu Local Municipality. The project Applicant will consult with the Local Municipality and specific arrangements for water to either be trucked in, or otherwise made available for collection at their Water Treatment Plant via a metered standpipe. These arrangements will be agreed on in a Service Level Agreement (SLA). The recommendations in this section only apply if groundwater will be used for the project.** | | | | | |
| • Lowering of groundwater | Avoid over-abstraction of | ▪ Monitoring of abstracted volumes, this would | ▪ Ensure that the monitoring of | ▪ Quarterly | ▪ Project Developer, |

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| levels as a result of over-abstraction | groundwater resources. | allow for the determination of the cumulative abstraction across each of the farm portions and boreholes to be made. This can be achieved using flow meters.<br>▪ Monitoring of groundwater levels, to evaluate the response of groundwater abstraction on the water table. This was be conducted manually or using telemetry systems.<br>▪ Monitoring of general field chemistry, e.g. pH, EC and temperature. However, during the construction period, the analysis and sample collection should include SANS 241 analysis for one year before and after the construction period – if the project schedule allows. | abstraction volumes is taken into consideration and that a Geohydrology Specialist with suitable qualifications and experience is appointed to undertake relevant tests by reviewing signed minutes of meetings or signed reports or the appointment letter.<br>▪ Ensure that the borehole parameters are documented to ensure trends and consumption can be monitored.<br>▪ Undertake an audit to verify if the monitoring programme is being implemented. | | Specialist, and ECO |
| • Potential impact on groundwater quality as a result of accidental oil spillages or fuel leakages | Minimise the potential of groundwater contamination | ▪ Vehicles must be regularly serviced and maintained to check and ensure there are no leakages. A designated area should be established at the construction site camp for this purpose.<br>▪ Any engines that stand in one place for an excessive length of time must have drip trays.<br>▪ Diesel fuel storage tanks should be above ground on an impermeable concrete surface in a bunded area.<br>▪ Construction vehicles and equipment should also be refuelled on an impermeable surface. A designated area should be established at the construction site camp for this purpose, if off-site refuelling is not possible.<br>▪ If spillages occur, they should be contained and removed as rapidly as possible, with correct disposal procedures of the spilled material, and reported.<br>▪ Proof of disposal (waste disposal slips or waybills) should be obtained and retained on file for auditing purposes.<br>▪ Biodegradable cleaning agents should be selected for cleaning Solar PV panels | ▪ Construction vehicles and equipment need to be monitored throughout the construction phase. Monitor via site audits and record non-compliance and incidents.<br>▪ Monitor the placement of fuel storage tanks and engines and use of drip trays at the site camp via visual inspections. Monitor the usage of spill containment measures and record and report non-compliance.<br>▪ Monitor the placement and designation of the area for refuelling at the site camp via visual inspections. Monitor the occurrence of potential spills and the usage of spill containment measures and record and report non-compliance.<br>▪ Monitor the refuelling/ servicing process and record the occurrence of any spillages. | ▪ Weekly<br>▪ As necessary | ▪ Project Developer<br>▪ Contractor<br>▪ ECO |

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| | | | ▪ Monitor the correct disposal of spilled material or contaminated soil and audit the waybills. Record and report non-compliance. | | |
| **B.11. GEOTECHNICAL IMPACTS** | | | | | |
| • Displacement of geologic materials | To minimise soil erosion by appropriately managing the displacement of geological materials, thereby minimising disturbance of existing soil conditions. | ▪ Favour dolerite as an aggregate (as opposed to Karoo sandstones and mudstones). Subject to investigation.<br>▪ Any road cuttings should be designed by an appropriately qualified professional.<br>▪ Drainage in the region should be designed and managed appropriately.<br>▪ Investigate and confirm the geotechnical suitability of each structure (or other appropriate level of investigation) prior to construction (i.e. determine that soil with an adequate bearing capacity is obtained beneath each footing). Such investigations would not be required to fulfil the requirements of the BA process. However, it would be necessary prior to construction.<br>▪ Only strip vegetation necessary for the next phase of construction.<br>▪ Install temporary drainage to divert stormwater away from active construction activities, where required.<br>▪ Stormwater Management Plan must be developed in the preconstruction phase. It should detail the stormwater structures and management interventions that must be installed to manage the increase of surface water flow directly into any natural systems (in consultation with suitably qualified professionals). Effective stormwater management must include effective stabilisation (e.g. gabions and Reno mattresses) of exposed soil.<br>▪ Suitable stormwater management systems must be installed along roads and other areas | ▪ Monitor activities via onsite inspections and report any non-compliance. | ▪ On-going | ▪ ECO |

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| | | and be monitored during the first few months of use. Any erosion/sedimentation must be resolved through any additional interventions that may be necessary (e.g., extension, energy dissipaters, spreaders, etc.).<br>▪ Where impacted through construction-related activities, all sloped areas must be stabilised to ensure proper rehabilitation is effected and erosion is controlled.<br>▪ Sloped areas stabilised using designed structures or vegetation as specified in the design to prevent erosion of embankments. The contract design specifications must be adhered to and implemented strictly.<br>▪ Any rehabilitation should be scheduled to ensure rehabilitation can take place at the optimal time for vegetation establishment.<br>▪ Where earthwork is being undertaken near any watercourses, slopes must be stabilised using suitable materials, e.g. sandbags or geotextile fabric, to prevent sand and rock from entering the channel.<br>▪ Appropriate rehabilitation and re-vegetation measures for any disturbed watercourse banks must be implemented timeously. In this regard, the banks should be appropriately and incrementally stabilised as soon as development allows. | | | |
| • Contamination of geologic materials | To minimise the contamination of geologic materials caused by spillages/leakages | ▪ During the execution of the works, appropriate measures to prevent pollution and contamination of the riparian environment must be implemented, e.g. including ensuring that construction equipment is well maintained.<br>▪ Provision must be made for refuelling at the storage area by protecting the soil with an impermeable groundcover. Where dispensing equipment is used, a drip tray must be used to ensure small spills are contained.<br>▪ Where refuelling away from the dedicated refuelling station is required, a mobile | ▪ Monitor activities and report any non-compliance. | ▪ On-going | ▪ ECO |

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| | | refuelling unit must be used. Appropriate ground protection such as drip trays must be used.<br>▪ If spillages occur, they should be contained and removed as rapidly as possible, with correct disposal procedures of the spilt material, as reported. Proof of disposal (waste disposal slips or waybills) should be obtained and retained on file for auditing purposes. | | | |
| **B.13. WASTE MANAGEMENT** | | | | | |
| • Pollution of the surrounding environment (including drainage lines) as a result of the handling, temporary stockpiling and disposal of general waste. | ▪ Reduce environmental impacts such as soil, surface water and groundwater contamination as a result of incorrect storage, handling and disposal of general waste.<br>▪ Minimise the production of waste.<br>▪ Ensure compliance with waste management legislation. | ▪ General waste (i.e., construction waste, building rubble, discarded concrete, bricks, tiles, wood, glass, windowpanes, air conditioners, plastic, metal, excavated material, packaging material, paper and domestic waste etc.) generated during the construction phase should be stockpiled temporarily (i.e., once-off) on site in a designated area within suitable waste collection bins and skips (or similar). Waste collection bins and skips should be covered with suitable material, where appropriate. | ▪ Monitor the strategic placement of the temporary, designated waste stockpiling area at the site camp via visual inspections, and record and report any non-compliance.<br>▪ Monitor the temporary storage and handling of general waste on site via site audits and record non-compliance and incidents (i.e., conduct visual inspections of the temporary waste storage area). | ▪ Once-off prior to the commencement of the construction phase and as required as the construction phase process evolves.<br>▪ Daily | ▪ ECO and Contractor<br>▪ ECO |
| | | ▪ Should the on-site stockpiling / storage of general waste exceed 80 $m^3$ and a period of 90 days, then the National Norms and Standards for the Storage of Waste (published on 29 November 2013 under GN 926) must be adhered to. | ▪ Record the amount of general waste that is temporarily stockpiled at the designated area on site, as well as the duration and record non-compliance and incidents.<br>▪ Monitor the duration and amounts of general waste that is temporarily stockpiled at the designated area on site via site audits and record non-compliance and incidents (i.e., conduct visual inspections of the temporary waste storage area).<br>▪ Audit compliance with the Norms and Standards for the Storage of Waste (published on 29 | ▪ Daily<br>▪ Weekly<br>▪ Monthly | ▪ Contractor<br>▪ ECO<br>▪ Project Developer |

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| | | | November 2013 under GN 926) if the storage amounts are exceeded (i.e., only if required). | | |
| | | ▪ Ensure that the designated stockpiling area for general waste (i.e., skips and waste collection bins) is inspected on a daily basis to verify its condition and integrity, particularly after rainfall events. | ▪ Monitor the temporary, designated waste stockpiling area at the site camp, as well as the handling of general waste on site via site audits and record non-compliance and incidents. | ▪ Daily | ▪ ECO |
| | | ▪ Ensure that general waste generated during the construction phase is removed from the site on a regular basis, and safely disposed of at an appropriate, licenced waste disposal facility by an approved waste management Contractor. Waste disposal slips or waybills should be kept on file as proof of disposal. As a general principle, waste manifests must be obtained to prove legal disposal of waste. The Department of Human Settlements, Water and Sanitation Northern Cape Region, Lower Orange Water Management Area office must be informed of the disposal method of waste prior to the commencement of construction. | ▪ Ensure that a suitable waste Management Contractor is appointed to remove and dispose the general waste at an appropriate, licenced waste disposal facility, and that the Department is informed of the disposal method prior to construction.<br>▪ Monitor waste disposal slips and waybills via site audits and record non-compliance and incidents. | ▪ Once-off prior to the construction phase.<br>▪ Weekly | ▪ Project Developer and ECO |
| | | ▪ Ensure that the construction site is kept clean at all times and that construction personnel are made aware of correct waste disposal methods. Littering must be prevented through effective site camp management. | ▪ Monitor the condition of the site camp throughout the construction phase via visual site inspections. Record non-compliance and incidents.<br>▪ Carry out Environmental Awareness Training.<br>▪ Conduct audits of the signed attendance registers. | ▪ Daily<br>▪ Once-off training and ensure that all new staff are inducted.<br>▪ Monthly | ▪ ECO and Contractor<br>▪ ECO and Contractor<br>▪ ECO |
| | | ▪ Sufficient general waste disposal bins must also be provided for use by construction personnel throughout the site. These bins must be emptied on a regular basis. | ▪ Monitor general waste generation by construction staff and collection via audits throughout the construction phase. | ▪ Daily or Weekly | ▪ ECO and Contractor. |
| | | ▪ Ensure that all general waste emanating from the construction phase is removed from site prior to the commencement of the rehabilitation and operational phases. | ▪ Undertake a final inspection at the end of the construction phase in order to verify and ensure that all general waste is removed | ▪ At the end of the construction phase. | ▪ ECO and Contractor. |

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| | | | from site and correctly disposed, prior to the commencement of the rehabilitation and operational phases. | | |
| | | ▪ Promote waste reduction, re-use, and recycling opportunities on site during the construction phase. | ▪ Monitor waste generation and collection throughout construction.<br>▪ Investigate if any complaints have been expressed by the surrounding community regarding waste handling. | ▪ Weekly or bi-weekly | ▪ ECO and Contractor |
| | | ▪ Ensure an adequate and sustainable use of resources. | ▪ Monitor waste generation and collection throughout construction. | ▪ Weekly or bi-weekly | ▪ ECO and Contractor |
| | | ▪ Control and implement waste management plans provided by contractors. Ensure that relevant legislative requirements are respected. | ▪ Control of waste management practices throughout construction phase | ▪ Weekly or bi-weekly | ▪ ECO and Contractor |
| • Pollution of the surrounding environment as a result of the handling, temporary stockpiling and disposal of hazardous waste. | Reduce environmental impacts such as soil, surface water and groundwater contamination as a result of incorrect storage, handling and disposal of hazardous waste. | ▪ Hazardous waste (i.e., empty tins, oils, fuel spillages, spilled materials, and chemicals etc.) generated during the construction phase should be stockpiled temporarily (i.e., once-off) on site in a designated area in suitable waste collection bins and leak-proof storage skips (or similar). Waste collection bins and skips should be covered with suitable material, where appropriate. Hazardous waste must be stored separately from all other general waste. The designated stockpiling area must be labelled correctly. | ▪ Monitor the strategic placement of the temporary, designated waste stockpiling area at the site camp via visual inspections, and record and report any non-compliance.<br>▪ Monitor the temporary storage and handling of hazardous waste on site via site audits and record non-compliance and incidents (i.e., conduct visual inspections of the temporary waste storage area). | ▪ Once-off prior to the commencement of the construction phase and as required as the construction process evolves.<br>▪ Daily | ▪ ECO and Contractor<br>▪ ECO |
| | | ▪ Should the on-site stockpiling of hazardous waste exceed 80 $m^3$, then the National Norms and Standards for the Storage of Waste (published on 29 November 2013 under GN 926) must be adhered to. | ▪ Record the amount of hazardous waste that is temporarily stockpiled at the designated area on site, as well as the duration and record non-compliance and incidents.<br>▪ Monitor the duration and amounts of hazardous waste that is temporarily stockpiled at the | ▪ Daily<br>▪ Weekly<br>▪ Monthly | ▪ Contractor<br>▪ ECO<br>▪ Project Developer |

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| | | | designated area on site via site audits and record non-compliance and incidents (i.e., conduct visual inspections of the temporary waste storage area).<br>▪ Audit compliance with the Norms and Standards for the Storage of Waste (published on 29 November 2013 under GN 926) if the storage amounts are exceeded (i.e., only if required). | | |
| | | ▪ Ensure that the designated stockpiling area for hazardous waste (i.e., leak proof skips and waste collection bins) is inspected on a daily basis to verify its condition and integrity, particularly after rainfall events. | ▪ Monitor the temporary, designated waste stockpiling area at the site camp, as well as the handling of hazardous waste on site via site audits and record non-compliance and incidents. | ▪ Daily | ▪ ECO |
| | | ▪ Ensure that all hazardous waste is removed from the site on a regular basis, and safely disposed at an appropriate, licenced hazardous waste disposal facility by an approved waste management Contractor. | ▪ Ensure that a suitable waste management contractor is appointed to remove and dispose the hazardous waste at an appropriate, licenced hazardous waste disposal facility.<br>▪ Monitor waste disposal slips and waybills via site audits and record non-compliance and incidents. | ▪ Once-off prior to the construction phase.<br>▪ Weekly | ▪ Project Developer/ Contractor<br>▪ ECO |
| | | ▪ Ensure that the construction site is kept clean at all times and that construction personnel are made aware of correct waste disposal methods. Littering must be prevented through effective site camp management. | ▪ Monitor the condition of the site camp throughout the construction phase via visual site inspections. Record non-compliance and incidents.<br>▪ Carry out Environmental Awareness Training.<br>▪ Conduct audits of the signed attendance registers. | ▪ Daily<br>▪ Once-off training and ensure that all new staff are inducted.<br>▪ Monthly | ▪ ECO and Contractor<br>▪ ECO and Contractor<br>▪ ECO |

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| | | ▪ Ensure that all hazardous waste emanating from the construction phase is removed from site prior to the commencement of the rehabilitation and operational phases. | ▪ Undertake a final inspection at the end of the construction phase in order to verify and ensure that all general waste is removed from site and correctly disposed, prior to the commencement of the rehabilitation and operational phases. | ▪ At the end of the construction phase. | ▪ ECO and Contractor. |
| | | ▪ All liquid waste (used oil, paints, lubricating compounds and grease) to be packaged and disposed of by appropriate means. | ▪ Waste removal and disposal to be monitored throughout construction | ▪ Weekly or bi-weekly | ▪ ECO and Contractor |
| | | ▪ Adequate containers for the cleaning of equipment and materials (paint, solvent) must be provided as to avoid spillages. | ▪ Waste removal and disposal to be monitored throughout construction | ▪ Weekly or bi-weekly | ▪ ECO and Contractor |
| | | ▪ Wastewater from construction and painting activities must be collected in a designated container and disposed of at a suitable disposal point off site. | ▪ Waste removal and disposal to be monitored throughout construction | ▪ Weekly or bi-weekly | ▪ ECO and Contractor |
| | | ▪ Control and implement waste management plans provided by contractors. Ensure that relevant legislative requirements are respected. | ▪ Control of waste management practices throughout construction phase. | ▪ Weekly or bi-weekly | ▪ ECO and Contractor |
| **B.13. HUNTING PRACTICES ON ADJACENT FARMS** | | | | | |
| • Potential impact on construction activities and personnel as a result of hunting practices on nearby or adjacent farms. | To ensure safety of construction activities and personnel as a result of hunting operations on nearby or adjacent farms. | ▪ Ensure that an open communication strategy is created and maintained between the Project Developer, Contractor and owners (or managers) of nearby or adjacent farms where hunting takes place in order to ensure that the Project Developer and Contractor are made aware of planned hunts.<br>▪ Ensure that construction personnel are made aware of the planned hunts and are trained on the necessary protocols to be taken. | ▪ Monitor and record the notifications received from the owners (or managers) of the adjacent farms where hunting takes place.<br>▪ Carry out Environmental Awareness Training and ensure that safety aspects are discussed in terms of hunting operations on adjacent farms. Conduct audits of the signed attendance registers.<br>▪ Carry out random inspections to ensure that planned hunts are being communicated to the | ▪ On-going<br>▪ Once-off at the commencement of construction and ensure that all new staff are inducted<br>▪ Monthly | ▪ Project Developer, ECO and Contractor<br>▪ Project Developer, ECO and Contractor<br>▪ Project Developer, ECO and Contractor |

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| | | | Project Developer and that construction personnel are being duly informed. | | |

## 10.3 OPERATIONAL PHASE

| C. OPERATIONAL PHASE | | | | | |
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| **C.1. AGRICULTURE AND SOILS IMPACTS** | | | | | |
| • Loss of large area of high yielding cropland | That existence of hard surfaces causes no erosion on or downstream of the site. | ▪ Maintain the stormwater run-off control system. Monitor erosion and remedy the stormwater control system in the event of any erosion occurring.<br>▪ Facilitate re-vegetation of denuded areas throughout the site | ▪ Undertake a periodic site inspection to verify and inspect the effectiveness and integrity of the stormwater run-off control system and to specifically record the occurrence of any erosion on site or downstream. Corrective action must be implemented to the run-off control system in the event of any erosion occurring. | ▪ Bi-annually | ▪ Facility Environmental Manager |
| **C.2. VISUAL IMPACTS** | | | | | |
| • The PV arrays may be perceived as an unwelcome visual intrusion, particularly in more natural undisturbed settings.<br>• The proposed solar PV facility will alter the visual character of the surrounding area and expose potentially sensitive visual receptor locations to visual impacts.<br>• Glint and glare may impact nearby receptors.<br>• Dust emissions and dust plumes from maintenance vehicles accessing the site via gravel roads may evoke | Minimise exposure of visual receptors to visual impacts. | ▪ Restrict vegetation clearance on the site to that which is required for the correct operation of the facility.<br>▪ As far as possible, limit the number of maintenance vehicles which are allowed to access the site.<br>▪ Ensure that suitable dust suppression techniques are implemented on all gravel access roads.<br>▪ As far as possible, limit the amount of security and operational lighting present on site.<br>▪ Light fittings for security at night should reflect the light toward the ground and prevent light spill.<br>▪ Lighting fixtures should make use of minimum lumen or wattage.<br>▪ Mounting heights of lighting fixtures should be limited, or alternatively, foot-light or bollard level lights should be used. | ▪ Conduct site inspections to monitor implementation and report any non-compliance. | ▪ Weekly | ▪ Solar Farm Operator and Environmental Officer / Manager |

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| negative sentiments from surrounding viewers.<br>• The night time visual environment will be altered as a result of operational and security lighting at the proposed PV facility. | | ▪ If economically and technically feasible, make use of motion detectors on security lighting.<br>▪ Buildings on the site should be painted with natural tones that fit with the surrounding environment.<br>▪ Non-reflective surfaces should be utilised where possible. | | | |
| **C.3. HERITAGE IMPACTS (ARCHAEOLOGY AND CULTURAL LANDSCAPE)** | | | | | |
| • Intrusion of solar facility into the landscape | Minimise visual intrusion<br>Minimise contrast and light pollution | ▪ Ensure that all maintenance vehicles and operational activities stay within designated areas.<br>▪ Make use of motion sensors, downlighters, etc to minimise lighting impacts at night.<br>▪ Paint structures in earthy tones to reduce contrast where technically feasible.<br>▪ Signage demarcating the entrance of the facility must be modest in nature and should not exceed the height of regular street signage | ▪ Undertake visual inspections and report non-compliance | ▪ As required | ▪ Environmental Manager |
| **C.4. TERRESTRIAL AND AQUATIC BIODIVERSITY AND SPECIES IMPACTS** | | | | | |
| • Creation of hard surfaces resulting in runoff, erosion and sedimentation | Management stormwater on site to minimise erosion and sedimentation | ▪ A Stormwater Management Plan (SWMP) must be developed, detailing the stormwater structures and management interventions that must be installed to manage the increase of surface water flows directly into any natural systems. Effective stormwater management must include effective stabilisation (gabions and Reno mattresses) of exposed soil.<br>▪ Monitoring should occur on a monthly basis for 6 months post construction and where any unstable soils occur, these must be protected with temporary stabilisation dependent on the scale of the impact i.e., sandbags - hay bales) until areas become revegetated. If any areas require permanent erosion protection (e.g., gabions or stone pitching) then this must be included in the GA application. | ▪ Implement SWMP<br>▪ Undertake audits following the construction phase and report any non-compliance. | ▪ During the operational phase especially during periods of high precipitation | ▪ Project Applicant |
| • Displacement of any animals which mostly includes animal mortalities related to vehicle traffic | Minimise and prevent animal mortalities | ▪ All vehicles must stick to designated and prepared roads and adhere to the speed limit on site of 40km/hr | ▪ Strictly monitor vehicle speed limits | ▪ Daily | ▪ ECO<br>▪ Contractor |

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| **C.6. AVIFAUNA IMPACTS** | | | | | |
| • Disturbance of avifauna during the operational phase | Minimise avifauna disturbance | ▪ Minimisation of disturbance footprint to the development footprint | ▪ Abide to the site layout plans. | ▪ During the operational phase | ▪ Project Developer<br>▪ EA holder |
| • Collisions with PV Panels | Minimise avifaunal fatalities and injuries due to PV panel collisions | ▪ Operational monitoring and carcass searching | ▪ Carcass searching to be carried out on a monthly basis during the operational phase | ▪ During the operational phase | ▪ ECO<br>▪ Contractor |
| • Electrocutions | Minimise avifaunal fatalities and injuries due to electrocutions | ▪ Insulation of all electrical infrastructure, and use of bird friendly designs as per Eskom Technical Standards<br>▪ Operational monitoring and carcass searching | ▪ Ensure that insulation requirements and bird friendly designs as per the Eskom Technical Standards are taken into consideration during planning and design phase and implemented during the construction phase.<br>▪ Carcass searching to be carried out on a monthly basis during the operational phase | ▪ During the operational phase | ▪ Project Developer<br>▪ EA holder<br>▪ Contractor |
| **C.7. SOCIO-ECONOMIC IMPACTS** | | | | | |
| • Impacts from expenditure on the operation of the project | Maximize positive benefits associated with spending injections into the area | ▪ Setting targets for how much local labour should be used based on the needs of the Applicant and the availability of existing skills and people that are willing to undergo training. Opportunities for the training of unskilled and skilled workers from local communities should be maximized.<br>▪ Using local sub-contractors where possible and requiring that contractors from outside the local area that tender also meet targets for how many locals are given employment.<br>▪ Exploring ways to enhance local community benefits with a focus on broad-based Black Economic Empowerment (BBBEE) and preferential procurement.<br>▪ Setting up a skills and services database in partnership with the local municipality and civil society for the local area before any hiring or contracting decisions are made. This can help to ensure fairness and limit potential | ▪ Undertake evaluations to monitor if targets are met.<br>▪ Undertake inspections to verify if local contractors are being used (where possible).<br>▪ Undertake inspections to verify if ways to enhance local community benefits with a focus on broad-based Black Economic Empowerment (BBBEE) are being explored.<br>▪ Undertake inspections to verify if a database has been set up.<br>▪ Attendance registers should be monitored and kept on file of all induction sessions.<br>▪ Undertake inspections to verify if counselling services have been made available.<br>▪ Undertake inspections to verify if | ▪ Annually or bi-annually<br>▪ Quarterly<br>▪ Quarterly<br>▪ Quarterly<br>▪ Quarterly<br>▪ Quarterly<br>▪ Quarterly<br>▪ Quarterly<br>▪ Quarterly | ▪ Project Developer and ECO |

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| | | interference in hiring processes.<br>▪ An effective employee induction programme is essential to ensuring that new employees, some of whom will be unfamiliar with the responsibilities of maintaining employment, are adequately prepared and motivated to adjust to the lifestyle required of them. This programme should incorporate life skills training as well as basic financial literacy training.<br>▪ Counselling services should be made available to employees to ensure that they have adequate guidance.<br>▪ Assisting smaller enterprises where possible in tendering for contracts and in accessing finance which are common constraints to their participation in projects.<br>▪ Avoiding potential service provider decisions that may lead to abuse or local dissatisfaction. For example, only appointing one accommodating rental agent or one catering supplier may lead to local dissatisfaction regarding the spreading of project benefits.<br>▪ As far as possible, avoid significant variation in salaries between various contractors for the same types of jobs. When variations are too high, the likelihood of dissatisfaction increases. | smaller enterprises are being assisted.<br>▪ Undertake inspections to verify if multiple service providers are being used.<br>▪ Undertake audits to avoid significant salary variations. | | |
| • Impacts associated with the funding of local socio-economic development, enterprise development and shareholding | Maximise positive impacts associated with funding local socio-economic development, enterprise development, and shareholding | ▪ The project must comply with the requirements of the Renewable Independent Power Producer Programme (REIPPP) and/or Broad-Based Black Economic Empowerment (BBBEE) requirements.<br>▪ The applicant must establish a communications committee early on in the project to ensure inclusive planning and regular feedback from stakeholders.<br>▪ Community development should be guided by a community needs analysis, drawn up by a third party and based on local socio-economic conditions, a review of planning documents such as the IDP, and discussions with local | ▪ Undertake an audit to ensure that the project complies with the REIPPP and/or BBBEE requirements.<br>▪ Verify if a committee has been established. Meeting minutes should be kept on file.<br>▪ Verify if a community needs analysis has been undertaken.<br>▪ Verify if stakeholder liaison is being undertaken. Communications with stakeholders should be kept on file. | ▪ Annually<br>▪ Quarterly<br>▪ Once-off<br>▪ Quarterly | ▪ Impacts associated with the funding of local socio-economic development, enterprise development and shareholding |

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| | | and district-level government and community representatives. Interventions should be planned in collaboration with other energy developers in the area where relevant.<br>▪ Close liaison with local and district-level municipal managers, local councillors and other stakeholders involved in socio-economic development is required to ensure that any projects are integrated into wider socio-economic development strategies and plans thus also minimise tourism impacts. | | | |
| • Impacts associated primarily with the influx of people | Minimise the negative impacts on an influx of people | ▪ A 'locals first' policy with regards to construction labour needs.<br>▪ The community should be able to contact the site manager or their representative to report any issues which they may have. The site manager and their representative should be stationed within the area and should therefore be available on hand to deal with and address any concerns which may be raised.<br>▪ A complaints register should be available on site to any individual who may have a particular complaint with regards to the construction process.<br>▪ The Applicant and the contractors should, develop a Code of Conduct for the project. The code should identify what types of behaviour and activities by workers are not permitted in agreement with surrounding landowners and land managers. For example, access on land that is not part of the development will not be allowed.<br>▪ Condoms should be freely available to employees and all contractor workers.<br>▪ Close coordination with the municipality is required, including regular meetings. | ▪ Undertake an audit to ensure that a "local first" policy has been compiled.<br>▪ Undertake inspections to verify if the site manager/ representative is contactable.<br>▪ Undertake inspections to verify if complaints register is being kept.<br>▪ Composition of workforce to be monitored during construction to assess the number of local residents employed. Review of the registers held by the contractors.<br>▪ Verify that a Code of Conduct is developed and is being implemented with written proof kept on file.<br>▪ Undertake inspections to verify if condoms are freely available.<br>▪ Verify that regular meetings are held with the municipality. Meeting minutes should be kept on file. | ▪ Once-off<br>▪ Monthly<br>▪ Quarterly<br>▪ Quarterly<br>▪ Quarterly<br>▪ Quarterly<br>▪ Quarterly | ▪ Project Developer and ECO |
| • Impacts on tourism | Minimise negative impacts on tourism | ▪ Impacts on tourism are dependent on how the site is developed and managed to minimise negative biophysical impacts. The measures recommended in other specialist reports to | ▪ Ensure that mitigation measures contained the EMPr are adhered to. | ▪ As required | ▪ Project Developer, Contractor, Specialists (if required) and ECO |

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| | | these impacts (primarily the minimisation of visual, heritage, traffic and ecological impacts) would thus also minimise tourism impacts. | | | |
| • Impacts on surrounding landowners and communities | Minimise the impact of the operational activities on the surrounding landowners and communities | ▪ No workers, except for security personnel, should be allowed to stay on the site overnight.<br>▪ The community should be able to contact the site manager to report any issues which they may have. The site manager should be stationed within the area and should therefore be available on hand to deal with and address any concerns which may be raised.<br>▪ A complaints register should be available on site to any individual who may have a particular complaint with regards to the construction or operations processes.<br>▪ The Applicant should develop a Code of Conduct for the project. The Code should identify what types of behaviour and activities by workers are not permitted in agreement with surrounding landowners and land managers.<br>▪ The movement of workers on and off the site should be closely managed and monitored by the contractors. In this regard the contractors should be responsible for making the necessary arrangements for transporting workers to and from site on a daily basis.<br>▪ The Applicant should implement measures to assist and, if needed, fairly compensate potentially affected surrounding landowners whereby damages to farm property, stock theft or significant disruptions to farming activities can be minimized or reduced. Measures should be agreed on before construction commences.<br>▪ The EMPr must outline procedures for managing and storing waste on site, specifically plastic waste that poses a threat to livestock if ingested.<br>▪ Mitigation measures proposed by other specialists, in particular those prescribed in the | ▪ Security records must be reviewed to verify no personnel stay over on site. Record and report any non-compliance.<br>▪ Undertake inspections to verify if the site manager/ representative is contactable.<br>▪ Undertake inspections to verify if complaints register is being kept.<br>▪ Verify that a Code of Conduct is developed and is being implemented with written proof kept on file.<br>▪ Monitor that transport of staff to and from site is provided and repor non-compliances.<br>▪ Verify if measures for compensating farmers and communities for any stock losses and/or damage to farm infrastructure linked to project construction workers. Record and report any non-compliance.<br>▪ Review EMPr to ensure that relevant information on waste management is included.<br>▪ Ensure the implementation and adherence to mitigation measures proposed by other specialists. | ▪ Monthly<br>▪ Monthly<br>▪ Quarterly<br>▪ Once-off<br>▪ Monthly<br>▪ Quarterly<br>▪ Once-off<br>▪ As required | ▪ Project Developer, Contractor and ECO |

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| | | TIA, need to be adhered to. | | | |
| • The generation of additional income represents a significant benefit for the local affected farmer(s) and reduces the risks to their livelihoods | Enhance benefits for affected landowner | ▪ Enter into and implement rental agreements with affected landowners for the use of the land for the establishment of the proposed PV facility.<br>▪ The loss of high-quality agricultural land should be avoided and/or minimised by careful planning in the final layout of the proposed PV facility. The recommendations of the agricultural / soil assessment should be implemented. Note: During the EIA Phase, no sensitive areas for avoidance were identified by the Agricultural specialist. The study area is predominately low to medium sensitivity from an agricultural perspective. | ▪ Undertake inspections to monitor compliance. | ▪ Monthly | ▪ Project Developer, Contractor and ECO |
| • Benefits associated with support for local communities from Socio-economic development (SED) contributions. | Enhance benefits for local communities | ▪ The Ubuntu Local Municipality (ULM) or Pixley Ka Seme District Municipality (PKSM) should be consulted as to the structure and identification of potential trustees to sit on the Community Trust. The key departments in the ULM or PKSDM that should be consulted include the Municipal Managers Office, IDP Manager and LED Manager, where possible.<br>▪ Clear criteria for identifying and funding community projects and initiatives in the area should be identified. The criteria should be aimed at maximising the benefits for the community as a whole and not individuals within the community.<br>▪ Strict financial management controls, including annual audits, should be instituted to manage the funds generated for the Community Trust from the Solar PV plant. | ▪ Ensure that the Community Trust is audited. | ▪ Annually | ▪ Project Developer and Contractor |
| **C.8. IMPACTS RESULTING FROM THE BATTERY ENERGY STORAGE SYSTEMS (BESS)** | | | | | |
| • Safety, health and environmental impacts as a result of the Solid State | Minimise the safety, health and environmental risks associated with the BESS | ▪ Consider the findings and recommendations of the High-Level Safety, Health and Environment Risk Assessment compiled for the BESS. | ▪ Conduct audits to verify if the preventative and mitigation measures have been considered | ▪ Ongoing<br>▪ Ongoing<br>▪ Ongoing | ▪ Project Developer, Contractor, and ECO |

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| Lithium Ion Battery Energy Storage System (BESS) and Redox Flow BESS | | Refer to Appendix D of this EMPr for a detailed list of preventative and mitigation measures for the BESS.<br>▪ Continually monitor the quantity of dangerous goods stored in containers within the operational footprint.<br>▪ Manage the end of life and disposal of BESS batteries/ electrolytes/ containers/ equipment according to the End-of-Life Plan. | and implemented, where relevant and required, during the operational phase. Report any non-compliance.<br>▪ Conduct audits to verify that the quantity of dangerous goods in containers is being monitored.<br>▪ Conduct and audit to verify that the End-of-Life Plan is being is being implemented and adhered to. Report any non-compliance. | | |
| **C.9. GEOHYDROLOGICAL IMPACTS** | | | | | |
| **Note from the CSIR: As a first option, water required for the construction, operational and decommissioning phases for of the proposed project will preferably be sourced from a borehole drilled on site, which will be subject to complete geohydrological testing and the necessary water use authorisation obtained (as applicable). The assessment further confirms that should ground water, if used, should be monitored (i.e., abstraction volumes, quality and water levels) and that this should ideally be implemented one year prior to the start of construction if the project timeframes permit. As a second option, water will be sourced from the Ubuntu Local Municipality. The project Applicant will consult with the Local Municipality and specific arrangements for water to either be trucked in, or otherwise made available for collection at their Water Treatment Plant via a metered standpipe. These arrangements will be agreed on in a Service Level Agreement (SLA). The recommendations in this section only apply if groundwater will be used for the project.** | | | | | |
| • Lowering of groundwater levels as a result of over-abstraction | Avoid over-abstraction of groundwater resources. | ▪ Monitoring of abstracted volumes, this would allow for the determination of the cumulative abstraction across each of the Farm portions and boreholes to be made. This can be achieved using flow meters.<br>▪ Monitoring of groundwater levels, to evaluate the response of groundwater abstraction on the water table. This was be conducted manually or using telemetry systems.<br>▪ Monitoring of general field chemistry, e.g. pH, EC and temperature. However, during the construction period, the analysis and sample collection should include SANS 241 analysis for one year before and after the construction period – if the project schedule allows. | ▪ Ensure that this is taken into consideration and that a Geohydrology Specialist with suitable qualifications and experience is appointed to undertake relevant tests by reviewing signed minutes of meetings or signed reports or the appointment letter.<br>▪ Ensure that the borehole parameters are documented to ensure trends and consumption can be monitored.<br>▪ Undertake an audit to verify if the monitoring programme is being implemented. | Quarterly | ▪ Project Developer<br>▪ Environmental Manager |
| • Potential impact on groundwater quality as a result of accidental oil spillages or fuel leakages | Minimise the potential of groundwater contamination | ▪ Vehicles must be regularly serviced and maintained to check and ensure there are no leakages. A designated area should be established at the construction site camp for this purpose.<br>▪ Any engines that stand in one place for an | ▪ Construction vehicles and equipment need to be monitored throughout the construction phase. Monitor via site audits and record non-compliance and incidents. | ▪ Weekly<br>▪ As necessary | ▪ Project Developer<br>▪ Environmental Manager |

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| | | excessive length of time must have drip trays.<br>▪ Diesel fuel storage tanks should be above ground on an impermeable concrete surface in a bunded area.<br>▪ Construction vehicles and equipment should also be refuelled on an impermeable surface. A designated area should be established at the construction site camp for this purpose, if off-site refuelling is not possible.<br>▪ If spillages occur, they should be contained and removed as rapidly as possible, with correct disposal procedures of the spilled material, and reported.<br>▪ Proof of disposal (waste disposal slips or waybills) should be obtained and retained on file for auditing purposes.<br>▪ Biodegradable cleaning agents should be selected for cleaning Solar PV panels | ▪ Monitor the placement of fuel storage tanks and engines and use of drip trays at the site camp via visual inspections. Monitor the usage of spill containment measures and record and report non-compliance.<br>▪ Monitor the placement and designation of the area for refuelling at the site camp via visual inspections. Monitor the occurrence of potential spills and the usage of spill containment measures and record and report non-compliance.<br>▪ Monitor the refuelling/ servicing process and record the occurrence of any spillages.<br>▪ Monitor the correct disposal of spilled material or contaminated soil and audit the waybills. Record and report non-compliance. | | |
| • Potential impact on groundwater quality as a result of electrolyte used for the BESS in the case of Redox flow batteries | Minimise the potential of groundwater contamination | ▪ Ensure that all electrolyte or chemicals stored or used on site have secondary containment systems in place with reliable leak detection, annunciation in place. Ensure that all chemicals are handled on concrete bunded surfaces and not on bare soil.<br>▪ Any waste products produced from the BESS systems should be removed and disposed of appropriately.<br>▪ Waste water produced by fire hydrants should not be allowed to runoff into the environment.<br>▪ It is recommended that all BESS's are placed a minimum of 50m from any borehole. | ▪ Monitor the placement and storage of electrolyte and chemicals via visual inspections. Monitor the implementation of spill containment measures and record and report non-compliance.<br>▪ Waste removal and disposal to be monitored. Monitor via site audits and record non-compliance and incidents. Monitor waste disposal slips and waybills via site audits and record non-compliance and incidents.<br>▪ Undertake inspections during usage of fire hydrants to ensure | ▪ Ongoing and as required during the operational phase | ▪ Project Developer<br>▪ Environmental Manager |

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| | | | compliance and report any concerns. | | |
| **C.10. GEOTECHNICAL IMPACTS** | | | | | |
| • Increased unnatural hard surfaces | To minimise erosion caused by the creation of unnatural hard surfaces i.e., road surfaces and stormwater drainage. | ▪ Install drainage to divert stormwater away from activities, roads/tracks, structures and erected structures, where required.<br>▪ Implement the stormwater management plan. Generic management for typical infrastructure of the proposed development, including similar erosion control and stormwater management during the construction phase, and no regular maintenance activities to take place outside of the authorised footprint and all vehicles to remain on authorised roads and tracks. | ▪ Monitor activities and report any non-compliance. | ▪ On-going | ▪ ECO |
| • Displacement of geologic materials | To minimise soil erosion by appropriately managing the displacement of geological materials, thereby minimising disturbance of existing soil conditions. | ▪ Install drainage to divert stormwater away from activities, roads/tracks, structures, where required.<br>▪ Generic management for typical infrastructure of the proposed development, including:<br>Stormwater Management Plan must be developed in the preconstruction phase and should detail the stormwater structures and management interventions that must be installed to manage the increase of surface water flows directly into any natural systems, where possible and lawful. Effective stormwater management must include effective stabilisation (e.g. gabions and Reno mattresses) of exposed soil etc.<br>Suitable stormwater management systems must be installed along roads and other areas and monitored during the first few months of use. Any erosion / sedimentation must be resolved through any additional interventions that may be necessary (e.g., extension, energy dissipaters, spreaders, etc.).<br>Sloped areas stabilised using design structures or vegetation as specified in the design to | ▪ Monitor activities via onsite inspections and report any non-compliance. | ▪ On-going | ▪ ECO |

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| | | prevent erosion of embankments.<br>No regular maintenance activities to take place outside of the authorised footprint and all vehicles to remain on authorised roads and tracks. | | | |
| • Contamination of geologic materials | To minimise the contamination of geologic materials caused by spillages/leakages | ▪ During the execution of the operations, appropriate measures to prevent pollution and contamination of the riparian environment must be implemented e.g. including ensuring that construction equipment is well maintained.<br>▪ Provision must be made for refuelling at the storage area by protecting the soil with an impermeable groundcover/bunding. Where dispensing equipment is used, a drip tray must be used to ensure small spills are contained.<br>▪ Where refuelling away from the dedicated refuelling station is required, a mobile refuelling unit must be used. Appropriate ground protection such as drip trays must be used.<br>▪ Electrolyte spillage to be mitigated through leak detection, double containment and suitably designed bunding for the structure, approved by a qualified professional.<br>▪ If spillages occur, they should be contained and removed as rapidly as possible, with correct disposal procedures of the spilled material, as reported. Proof of disposal (waste disposal slips or waybills) should be obtained and retained on file for auditing purposes.<br>▪ The maintenance of solar panels must be closely monitored and the use of hazardous chemical products must be avoided when solar panels are cleaned. | ▪ Monitor activities and report any non-compliance. | ▪ On-going | ▪ ECO |
| **C.11. TRAFFIC IMPACTS** | | | | | |
| • Pollution of the surrounding environment as a result of the handling, temporary storage and disposal of solid waste | Reduce soil and groundwater contamination as a result of incorrect storage, handling, and disposal of general and hazardous waste. | ▪ Sufficient waste collection bins and skips (or similar) should be provided at the PV facility. Waste collection bins and skips should be covered with suitable material and correctly labelled, and should be kept in a designated, demarcated area, where access control is | ▪ Monitor waste generation and collection throughout the operational phase. | ▪ Weekly | ▪ Facility Manager |

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| (general and hazardous). | | monitored and managed. | | | |
| | | ▪ Segregation of hazardous waste from general waste to be in place. Waste separation is encouraged and therefore receptacles should be labelled to reflect the different waste types. | ▪ On-site inspection of waste segregation.<br>▪ Control of waste management practices throughout operational phase. | ▪ Weekly<br>▪ Weekly | ▪ Facility Manager<br>▪ Facility Manager |
| | | ▪ General waste and hazardous waste should be removed from the site on a regular basis and disposed of at an appropriate, licenced waste disposal facility. Hazardous waste should be removed by an approved waste management Contractor. General solid waste could be removed from the site by municipal services. Waste disposal slips or waybills should be kept on file for auditing purposes as proof of disposal, as applicable | ▪ Inspection of the waste storage area.<br>▪ Monitor via site audits and record non-compliance and incidents. Facility Manager to monitor and audit disposal slips. | ▪ Daily<br>▪ Monthly | ▪ Facility Manager |
| | | ▪ Ensure that the PV facility is kept clean at all times and that operational personnel are made aware of correct waste disposal methods. | ▪ Conduct training for all operational personnel.<br>▪ Monitor the state of PV facility via site audits and record non-compliance and incidents. | ▪ Once-off during operations and ensure that all new staff are inducted.<br>▪ Daily | ▪ Facility Manager |
| | | ▪ No solid waste may be burned or buried on site. | ▪ Monitor via site audits and record non-compliance and incidents. | ▪ Daily | ▪ Facility Manager |
| | | ▪ Waste amounts shall be recorded on a monthly basis. | ▪ Waste amounts to be documented. | ▪ Monthly | ▪ Facility Manager |
| | | ▪ All operational waste (concrete, steel, rubbles etc.) to be removed from the site and waste hierarchy of prevention, as the preferred option, followed by reuse, recycling, recovery must be implemented, where possible.<br>▪ Other non-hazardous solid waste (e.g., packaging material) to be disposed of at a licensed landfill.<br>▪ All liquid waste (used oil, paints, lubricating compounds and grease) to be packaged and disposed of by appropriate means.<br>▪ Adequate containers for the cleaning of equipment and materials (paint, solvent) must be provided as to avoid spillages.<br>▪ Wastewater from operations and painting | ▪ Waste removal and disposal to be monitored | ▪ Monthly | ▪ Facility Manager |

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| | | activities must be collected in a designated container and disposed of at a suitable disposal point off site. | | | |
| **C.12. HUNTING PRACTICES ON ADJACENT FARMS** | | | | | |
| • Potential impact on operational activities and personnel as a result of hunting practices on nearby or adjacent farms. | To ensure safety of operational activities and personnel as a result of hunting operations on nearby or adjacent farms. | ▪ Ensure that an open communication strategy is created and maintained between the Project Developer and owners (or managers) of nearby or adjacent farms where hunting takes place in order to ensure that the Project Developer are made aware of planned hunts.<br>▪ Ensure that operational personnel are made aware of the planned hunts and are trained on the necessary protocols to be taken. | ▪ Monitor and record the notifications received from the owners (or managers) of the adjacent farms where hunting takes place.<br>▪ Carry out Environmental Awareness Training and ensure that safety aspects are discussed in terms of hunting operations on adjacent farms. Conduct audits of the signed attendance registers.<br>▪ Carry out random inspections to ensure that planned hunts are being communicated to the Project Developer and that operational personnel are being duly informed. | ▪ On-going<br>▪ Once-off at the commencement of operations and ensure that all new staff are inducted<br>▪ Monthly | ▪ Facility Manager |

## 10.4 DECOMMISSIONING PHASE

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| **D. DECOMMISSIONING PHASE** | | | | | |
| **D.1. AGRICULTURE AND SOILS IMPACTS** | | | | | |
| • Erosion | That disturbance and existence of hard surfaces causes no erosion on or downstream of the site. | ▪ Implement an effective system of stormwater run-off control, where it is required - that is at any points where run-off water might accumulate. The system must effectively collect and safely disseminate any run-off water from all accumulation points and it must prevent any potential down slope erosion.<br>▪ Maintain where possible all vegetation cover and facilitate re-vegetation of denuded areas throughout the site, to stabilize disturbed soil against erosion. | ▪ Undertake a periodic site inspection to verify and inspect the effectiveness and integrity of the stormwater run-off control system and to specifically record the occurrence of any erosion on site or downstream. Corrective action must be implemented to the run-off control system in the event of any erosion occurring.<br>▪ Undertake a periodic site | ▪ Every 2 months during the decommissioning phase, and then every 6 months after completion of decommissioning, until final sign-off is achieved.<br>▪ Every 4 months during the | ▪ ECO |

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| | | | inspection to record the occurrence of and re-vegetation progress of all areas that require re-vegetation. | decommissioning phase, and then every 6 months after completion of decommissioning, until final sign-off is achieved. | |
| • Topsoil loss | That topsoil loss is minimised | ▪ If an activity will mechanically disturb the soil below surface in any way, then any available topsoil should first be stripped from the entire surface to be disturbed and stockpiled for re-spreading during rehabilitation. During rehabilitation, the stockpiled topsoil must be evenly spread over the entire disturbed surface. | ▪ Record GPS positions of all significant occurrences (that is an area of greater than 25 square metres) of below-surface soil disturbance (e.g., excavations). Record the date of topsoil stripping and replacement. Check that topsoil covers the entire disturbed area. | ▪ As required, whenever areas are disturbed. | ▪ ECO |
| **D.2. VISUAL IMPACTS** | | | | | |
| • Vehicles and equipment required for decommissioning will alter the natural character of the study area and expose visual receptors to visual impacts.<br>• Decommissioning activities may be perceived as an unwelcome visual intrusion.<br>• Dust emissions and dust plumes from increased traffic on the gravel roads serving the decommissioning site may evoke negative sentiments from surrounding viewers.<br>• Surface disturbance during decommissioning would expose bare soil (scarring) which could visually | Minimise exposure of visual receptors to visual impacts. | ▪ All infrastructure that is not required for post-decommissioning use should be removed.<br>▪ Carefully plan to minimize the decommissioning period and avoid delays.<br>▪ Maintain a neat decommissioning site by removing rubble and waste materials regularly.<br>▪ Ensure that dust suppression procedures are maintained on all gravel access roads throughout the decommissioning phase.<br>▪ All cleared areas should be rehabilitated as soon as possible. | ▪ Conduct site inspections to verify the implementation of mitigation measures and ensure good housekeeping is maintained. Record and report any non-compliance. | ▪ Weekly, as well as a prescribed maintenance period thereafter (usually one year). | ▪ ECO / Contractor / qualified rehabilitation ecologist or horticulturist. |

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| contrast with the surrounding environment.<br>• Temporary stockpiling of soil during decommissioning may alter the flat landscape. Wind blowing over these disturbed areas could result in dust which would have a visual impact.<br>• Decommissioned infrastructure left on the site may be visually intrusive. | | | | | |
| **D.3. HERITAGE IMPACTS (ARCHAEOLOGY AND CULTURAL LANDSCAPE)** | | | | | |
| • Damage or destruction of archaeological sites, buildings, or graves | ▪ Rescue information, artefacts or burials before extensive damage occurs<br>▪ Avoid impacts to archaeological materials | ▪ Reporting chance finds of graves and dense clusters of artefacts as early as possible to an archaeologist and/or Heritage Western Cape (HWC), protect in situ and stop work in immediate area and appoint archaeologist to exhume or sample as needed (where relevant).<br>▪ No stones may be removed from any archaeological site.<br>▪ | ▪ Inform staff to be vigilant and carry out inspections of all new excavations.<br>▪ Ensure that this is taken into consideration during chance finds or when required during the decommissioning phase. A copy of the contact details of the relevant HWC officials must be kept on file at the site office at all times. The Contractor must be aware of such details and requirements. | ▪ Ongoing basis | ▪ Project Developer, Contractor and ECO |
| • Intrusion of solar facility into the landscape | Minimise intrusion into the cultural landscape | ▪ Minimise duration of decommissioning period<br>▪ Ensure the effective rehabilitation of all areas disturbed by decommissioning activities following specialist rehabilitation plan.<br>▪ Lighting mitigation must be employed to ensure that light is directed only to where it is needed and, preferably, that it only switches on when needed | ▪ Monitor compliance and success of rehabilitation | ▪ As required | ▪ Environmental Manager |
| **D.4. PALAEONTOLOGY IMPACTS** | | | | | |
| • Disturbance/damage and | Safeguarding, recording, and | ▪ Chance Fossils Finds Protocol | ▪ Ensure that the Chance Fossil | ▪ Ongoing during the | ▪ ECO |

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| destruction of fossils at /below surface | sampling of palaeontological materials encountered or exposed during construction (Chance Fossil Finds) | ▪ Significant fossil finds should be safeguarded and reported as soon as possible to the South African Heritage Resources Agency (SAHRA) (Contact details: 111 Harrington Street, Cape Town, 8001. PO Box 4637, Cape Town, 8000. Tel: 021 462 4502. Fax: 021 462 4509. Email: info@sahra.org.za).<br>▪ Before any fossil material can be collected from the development site, the specialist involved would need to apply for a collection permit from SAHRA. Fossil material must be housed in an official collection (museum or university), while all reports and fieldwork should meet the minimum standards for palaeontological impact studies proposed by SAHRA (2012). | Finds Protocol is implemented if any fossiliferous deposits are exposed or during chance fossil finds. Undertake inspections and report any non-compliance.<br>▪ Regular visual inspection of substantial excavations ( > 1 m) and cleared areas for fossil remains.<br>▪ The immediate area of the fossil find must be safeguarded with security tape / fence / sand bags if necessary. | decommissioning phase | ▪ Contractor<br>▪ Appointed palaeontologist |
| **D.5. TERRESTRIAL AND AQUATIC BIODIVERSITY AND SPECIES IMPACTS** | | | | | |
| • Damage or loss of riparian and riverine systems and disturbance of the waterbodies in the construction phase | To reduce the loss of and impact on aquatic ecosystems | ▪ Development of the SWMP and Aquatic Rehabilitation and Monitoring Plan, is recommended.<br>▪ Suitable stormwater management systems must be installed along roads and other areas and monitored during the first few months of use. Any erosion / sedimentation must be resolved through whatever additional interventions maybe necessary (i.e., extension, energy dissipaters, spreaders, etc).<br>▪ Furthermore, the following applies to watercourse crossing upgrades:<br>• All alien plant re-growth, which is currently low within the greater region must be monitored and should it occur, these plants must be eradicated within the project footprints and especially in areas near the decommissioned crossings. | ▪ Monitor activities and record and report non-compliance.<br>▪ Apply for relevant permits with relevant authorities.<br>▪ Strict control over the behaviour of construction workers, restricting activities to within demarcated areas for construction.<br>▪ ECO must monitor activities and record and report non-compliance.<br>• Strict control and proper education of staff to prevent misconduct. If ECO is absent, there should be a designated Environmental Officer (EO) present to deal with any urgent issues. | ▪ Daily during periods of river flow during decommissioning<br>▪ Monthly during the decommissioning phase. | ▪ Contractor<br>▪ ECO |
| • Impact on localised surface water quality (Spills and leaks from construction vehicles / machinery when working in | Avoid, prevent and minimise the impact on water quality | ▪ All liquid chemicals including fuels and oil, including for the BESS, must be stored in with secondary containment (bunds or containers or berms) that can contain a leak or spill. Such facilities must be inspected routinely and must have the suitable PPE and spill kits needed to | ▪ Strict control over the behaviour of construction workers, restricting activities to within demarcated areas for construction. | • Daily during periods of river flow during decommissioning<br>• Monthly during the decommissioning phase. | ▪ Contractor<br>▪ ECO |

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| or near the delineated systems) | | contain likely worst-case scenario leak or spill in that facility, safely.<br>▪ Washing and cleaning of equipment must be done in designated wash bays, where rinse water is contained in evaporation/sedimentation ponds (to capture oils, grease cement and sediment).<br>▪ Mechanical plant and bowsers must not be refuelled or serviced within 100m of a river channel.<br>▪ All construction camps, laydown areas, wash bays, batching plants or areas and any stores should be more than 50m from any demarcated water courses.<br>▪ Littering and contamination associated with construction activity must be avoided through effective construction camp management.<br>▪ No stockpiling should take place within or near a water course.<br>• All stockpiles must be protected and located in flat areas where run-off will be minimised and sediment recoverable. | ▪ ECO must monitor activities and record and report non-compliance.<br>• Strict control and proper education of staff to prevent misconduct. If ECO is absent, there should be a designated Environmental Officer (EO) present to deal with any urgent issues. | | |
| **D.7. AVIFAUNA IMPACTS** | | | | | |
| • Disturbance of avifauna during the decommissioning phase | Prevent unnecessary displacement of avifauna by ensuring that contractors are aware of the requirements of the Decommissioning EMPr. | ▪ Avifaunal Pre-decommissioning walkthrough<br>▪ A site-specific Decommissioning EMPr (DEMPr) must be implemented, which gives appropriate and detailed description of how construction activities must be conducted. All contractors are to adhere to the DEMPr and should apply good environmental practice during decommissioning. The DEMPr must specifically include the following:<br>o No off-road driving;<br>o Maximum use of existing roads during the decommissioning phase and the construction of new roads should be kept to a minimum as far as practical;<br>o Measures to control noise and dust according to latest best practice; | ▪ Implementation of the DEMPr. Oversee activities to ensure that the DEMPr is implemented and enforced via site audits and inspections. Report and record any non-compliance.<br>▪ Ensure that decommissioning personnel are made aware of the impacts relating to off-road driving.<br>▪ Access roads must be demarcated clearly. Undertake site inspections to verify.<br>▪ Monitor the implementation of noise control mechanisms via site inspections and record and report non-compliance. | ▪ Once off pre-decommissioning walkthrough by avifaunal specialists<br>▪ Daily | ▪ Appointed avifaunal specialist<br>▪ Contractor<br>▪ ECO |

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| | | ○ Restricted access to the rest of the property, the activity should as far as possible be restricted to the development footprint;<br>○ Strict application of all recommendations in the ecological and botanical specialist studies, especially as far as limitation of the activity footprint is concerned. | ▪ Ensure that the decommissioning area is demarcated clearly and that personnel are made aware of these demarcations. Monitor via site inspections and report non-compliance. | | |
| • Habitat loss during the decommissioning phase | Minimise habitat loss and displacement of avifauna | ▪ Rehabilitation of vegetation of entire development footprint | ▪ Ensure that the rehabilitation of vegetation is taken into consideration during pre-decommissioning planning phase and implemented during the decommissioning phase. | ▪ Once-off following re-vegetation.<br>▪ Rehabilitated area to be monitored on a monthly basis for 6 months following rehabilitation | ▪ Project developer<br>▪ Contractor<br>▪ ECO |
| **D.8. SOCIO-ECONOMIC IMPACTS** | | | | | |
| • Impacts from expenditure on the decommissioning of the project | Maximize positive benefits associated with spending injections into the area | ▪ Setting targets for how much local labour should be used based on the needs of the Applicant and the availability of existing skills and people that are willing to undergo training. Opportunities for the training of unskilled and skilled workers from local communities should be maximized.<br>▪ Using local sub-contractors where possible and requiring that contractors from outside the local area that tender also meet targets for how many locals are given employment.<br>▪ Exploring ways to enhance local community benefits with a focus on broad-based Black Economic Empowerment (BBBEE) and preferential procurement.<br>▪ Setting up a skills and services database in partnership with the local municipality and civil society for the local area before any hiring or contracting decisions are made. This can help to ensure fairness and limit potential interference in hiring processes.<br>▪ An effective employee induction programme is | ▪ Undertake evaluations to monitor if targets are met.<br>▪ Undertake inspections to verify if local contractors are being used (where possible).<br>▪ Undertake inspections to verify if ways to enhance local community benefits with a focus on broad-based Black Economic Empowerment (BBBEE) are being explored.<br>▪ Undertake inspections to verify if a database has been set up.<br>▪ Attendance registers should be monitored and kept on file of all induction sessions.<br>▪ Undertake inspections to verify if counselling services have been made available.<br>▪ Undertake inspections to verify if smaller enterprises are being assisted. | ▪ Annually or bi-annually<br>▪ Quarterly<br>▪ Quarterly<br>▪ Quarterly<br>▪ Quarterly<br>▪ Quarterly<br>▪ Quarterly<br>▪ Quarterly | ▪ Impacts from expenditure on the operation of the project |

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| | | essential to ensuring that new employees, some of whom will be unfamiliar with the responsibilities of maintaining employment, are adequately prepared and motivated to adjust to the lifestyle required of them. This programme should incorporate life skills training as well as basic financial literacy training.<br>▪ Counselling services should be made available to employees to ensure that they have adequate guidance.<br>▪ Assisting smaller enterprises where possible in tendering for contracts and in accessing finance which are common constraints to their participation in projects.<br>▪ Avoiding potential service provider decisions that may lead to abuse or local dissatisfaction. For example, only appointing one accommodating rental agent or one catering supplier may lead to local dissatisfaction regarding the spreading of project benefits.<br>▪ As far as possible, avoid significant variation in salaries between various contractors for the same types of jobs. When variations are too high, the likelihood of dissatisfaction increases. | ▪ Undertake inspections to verify if multiple service providers are being used.<br>▪ Undertake audits to avoid significant salary variations. | | |
| • Impacts associated primarily with the influx of people | Minimise the negative impacts on an influx of people | ▪ A 'locals first' policy with regards to construction labour needs.<br>▪ The community should be able to contact the site manager or their representative to report any issues which they may have. The site manager and their representative should be stationed within the area and should therefore be available on hand to deal with and address any concerns which may be raised.<br>▪ A complaints register should be available on site to any individual who may have a particular complaint with regards to the construction process.<br>▪ The Applicant and the contractors should, develop a Code of Conduct for the project. The code should identify what types of behaviour | ▪ Undertake an audit to ensure that a "local first" policy has been compiled.<br>▪ Undertake inspections to verify if the site manager/ representative is contactable.<br>▪ Undertake inspections to verify if complaints register is being kept.<br>▪ Composition of workforce to be monitored during construction to assess the number of local residents employed. Review of the registers held by the contractors.<br>▪ Verify that a Code of Conduct is developed and is being | ▪ Once-off<br>▪ Monthly<br>▪ Quarterly<br>▪ Quarterly<br>▪ Quarterly<br>▪ Quarterly<br>▪ Quarterly | ▪ Project Developer and ECO |

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| | | and activities by workers are not permitted in agreement with surrounding landowners and land managers. For example, access on land that is not part of the development will not be allowed.<br>▪ Condoms should be freely available to employees and all contractor workers.<br>▪ Close coordination with the municipality is required, including regular meetings.<br>▪ Arrangements must be made to enable workers from outside the area to return home at reasonably regular intervals. This would reduce the risk posed by non-local decommissioning workers to local family structures and social networks.<br>▪ The contractor should make the necessary arrangements for ensuring that all non-local construction workers are transported back to their place of residence once the construction phase is completed. | implemented with written proof kept on file.<br>▪ Undertake inspections to verify if condoms are freely available.<br>▪ Verify that regular meetings are held with the municipality. Meeting minutes should be kept on file.<br>▪ Monitor if arrangements are being made to enable workers from outside the area to return home.<br>▪ Verify that workers are transported to their place of residence following contract closure. | | |
| • Impacts on tourism | Minimise negative impacts on tourism | ▪ Impacts on tourism are dependent on how the site is developed and managed to minimise negative biophysical impacts. The measures recommended in other specialist reports to these impacts (primarily the minimisation of visual, heritage, traffic and ecological impacts) would thus also minimise tourism impacts. | ▪ Ensure that mitigation measures contained the EMPr are adhered to. | ▪ As required | ▪ Project Developer, Contractor, Specialists (if required) and ECO |
| • Impacts on surrounding landowners and communities | Minimise the impact of the decommissioning activities on the surrounding landowners and communities | ▪ No construction workers, except for security personnel, should be allowed to stay on the site overnight.<br>▪ The community should be able to contact the site manager to report any issues which they may have. The site manager should be stationed within the area and should therefore be available on hand to deal with and address any concerns which may be raised.<br>▪ A complaints register should be available on site to any individual who may have a particular complaint with regards to the construction or operations processes. | ▪ Security records must be reviewed to verify no personnel stay over on site. Record and report any non-compliance.<br>▪ Undertake inspections to verify if the site manager/ representative is contactable.<br>▪ Undertake inspections to verify if complaints register is being kept.<br>▪ Verify that a Code of Conduct is developed and is being implemented with written proof kept on file. | ▪ Monthly<br>▪ Monthly<br>▪ Quarterly<br>▪ Once-off<br>▪ Monthly<br>▪ Quarterly<br>▪ Once-off<br>▪ As required | ▪ Project Developer, Contractor and ECO |

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| | | ▪ The Applicant should develop a Code of Conduct for the project. The Code should identify what types of behaviour and activities by workers are not permitted in agreement with surrounding landowners and land managers.<br>▪ The movement of workers on and off the site should be closely managed and monitored by the contractors. In this regard the contractors should be responsible for making the necessary arrangements for transporting workers to and from site on a daily basis.<br>▪ The Applicant should implement measures to assist and, if needed, fairly compensate potentially affected surrounding landowners whereby damages to farm property, stock theft or significant disruptions to farming activities can be minimized or reduced. Measures should be agreed on before construction commences.<br>▪ The EMPr must outline procedures for managing and storing waste on site, specifically plastic waste that poses a threat to livestock if ingested.<br>▪ Mitigation measures proposed by other specialists, in particular those prescribed in the TIA, need to be adhered to. | ▪ Monitor that transport of staff to and from site is provided and repor non-compliances.<br>▪ Verify if measures for compensating farmers and communities for any stock losses and/or damage to farm infrastructure linked to project construction workers. Record and report any non-compliance.<br>▪ Review EMPr to ensure that relevant information on waste management is included.<br>▪ Ensure the implementation and adherence to mitigation measures proposed by other specialists. | | |
| **D.9. IMPACTS RESULTING FROM THE BATTERY ENERGY STORAGE SYSTEMS (BESS)** | | | | | |
| • Safety, health and environmental impacts as a result of the Solid State Lithium Ion Battery Energy Storage System (BESS) and Redox Flow BESS | Minimise the safety, health and environmental risks associated with the BESS | ▪ Consider the findings and recommendations of the High-Level Safety, Health and Environment Risk Assessment compiled for the BESS. Refer to Appendix D of this EMPr for a detailed list of preventative and mitigation measures for the BESS.<br>▪ Continually monitor the quantity of dangerous goods stored in containers stored within the facility footprint.<br>▪ Manage the end of life and disposal of BESS batteries/ electrolytes/ containers/ equipment according to the End-of-Life Plan. | ▪ Conduct audits to verify if the preventative and mitigation measures have been considered and implemented, where relevant and required, during the decommissioning phase. Report any non-compliance.<br>▪ Conduct audits to verify that the quantity of dangerous goods in containers is being monitored.<br>▪ Conduct and audit to verify that the End-of-Life Plan is being is being implemented and adhered | ▪ Ongoing<br>▪ Ongoing<br>▪ Ongoing | ▪ Project Developer, Contractor, and ECO |

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| | | | to. Report any non-compliance. | | |
| **D.10. GEOHYDROLOGICAL IMPACTS** | | | | | |
| **Note from the CSIR: As a first option, water required for the construction, operational and decommissioning phases for of the proposed project will preferably be sourced from a borehole drilled on site, which will be subject to complete geohydrological testing and the necessary water use authorisation obtained (as applicable). The assessment further confirms that should ground water, if used, should be monitored (i.e., abstraction volumes, quality and water levels) and that this should ideally be implemented one year prior to the start of construction if the project timeframes permit. As a second option, water will be sourced from the Ubuntu Local Municipality. The project Applicant will consult with the Local Municipality and specific arrangements for water to either be trucked in, or otherwise made available for collection at their Water Treatment Plant via a metered standpipe. These arrangements will be agreed on in a Service Level Agreement (SLA). The recommendations in this section only apply if groundwater will be used for the project.** | | | | | |
| • Lowering of groundwater levels as a result of over-abstraction | Avoid over-abstraction of groundwater resources. | ▪ Monitoring of abstracted volumes, this would allow for the determination of the cumulative abstraction across each of the Farm portions and boreholes to be made. This can be achieved using flow meters.<br>▪ Monitoring of groundwater levels, to evaluate the response of groundwater abstraction on the water table. This was be conducted manually or using telemetry systems.<br>▪ Monitoring of general field chemistry, e.g. pH, EC and temperature. However, during the construction period, the analysis and sample collection should include SANS 241 analysis for one year before and after the construction period – if the project schedule allows. | ▪ Ensure that this is taken into consideration and that a Geohydrology Specialist with suitable qualifications and experience is appointed to undertake relevant tests by reviewing signed minutes of meetings or signed reports or the appointment letter.<br>▪ Ensure that the borehole parameters are documented to ensure trends and consumption can be monitored.<br>▪ Undertake an audit to verify if the monitoring programme is being implemented. | Monthly | Project Developer<br>Hydrologist<br>ECO |
| • Potential impact on groundwater quality as a result of accidental oil spillages or fuel leakages | Minimise the potential of groundwater contamination | ▪ Vehicles must be regularly serviced and maintained to check and ensure there are no leakages. A designated area should be established at the construction site camp for this purpose.<br>▪ Any engines that stand in one place for an excessive length of time must have drip trays.<br>▪ Diesel fuel storage tanks should be above ground on an impermeable concrete surface in a bunded area.<br>▪ Construction vehicles and equipment should also be refuelled on an impermeable surface. A designated area should be established at the construction site camp for this purpose, if off- | ▪ Construction vehicles and equipment need to be monitored throughout the construction phase. Monitor via site audits and record non-compliance and incidents.<br>▪ Monitor the placement of fuel storage tanks and engines and use of drip trays at the site camp via visual inspections. Monitor the usage of spill containment measures and record and report non-compliance.<br>▪ Monitor the placement and | ▪ Weekly<br>▪ As necessary | ▪ Project Developer<br>▪ Contractor<br>▪ ECO |

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| | | site refuelling is not possible.<br>▪ If spillages occur, they should be contained and removed as rapidly as possible, with correct disposal procedures of the spilled material, and reported.<br>▪ Proof of disposal (waste disposal slips or waybills) should be obtained and retained on file for auditing purposes.<br>▪ Biodegradable cleaning agents should be selected for cleaning Solar PV panels | designation of the area for refuelling at the site camp via visual inspections. Monitor the occurrence of potential spills and the usage of spill containment measures and record and report non-compliance.<br>▪ Monitor the refuelling/ servicing process and record the occurrence of any spillages.<br>▪ Monitor the correct disposal of spilled material or contaminated soil and audit the waybills. Record and report non-compliance. | | |
| **D.11. GEOTECHNICAL IMPACTS** | | | | | |
| • Increased unnatural hard surfaces | Minimise erosion caused by the creation of unnatural hard surfaces i.e., road surfaces and stormwater drainage. | ▪ Only drive and park vehicles where necessary.<br>▪ It is recommended that the natural topography to be reinstated and land rehabilitation to near natural state is achieved, i.e., removal of foundations and backfilling of any resultant voids within the soil, as well as removal of hard surfaced areas. Replacement soil should be sourced locally to ensure homogeneity.<br>▪ Reinstate natural topography where cut-to-fill embankments have been constructed.<br>▪ Implement generic environmental management procedures for infrastructure. | ▪ Monitor activities and report any non-compliance. | ▪ On-going | ▪ ECO |
| • Displacement of geologic materials | To minimise soil erosion by appropriately managing the displacement of geological materials, thereby minimising disturbance of existing soil conditions. | ▪ Only drive and park vehicles where necessary.<br>▪ Land rehabilitation to near natural state, i.e. removal of foundations and backfilling of any resultant voids within the soil, as well as removal of hard surfaced areas. Replacement soil should be sourced locally to ensure homogeneity.<br>▪ Reinstate natural topography where cut-to-fill embankments have been constructed.<br>▪ Implement generic environmental management procedures for infrastructure. | ▪ Monitor activities via onsite inspections and report any non-compliance. | ▪ On-going | ▪ ECO |

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| • Contamination of geologic materials | To minimise the contamination of geologic materials caused by spillages/leakages | ▪ During the execution of the decommissioning, appropriate measures to prevent pollution and contamination of the riparian environment must be implemented e.g., including ensuring that equipment is well maintained.<br>▪ Provision must be made for refuelling at the storage area by protecting the soil with an impermeable groundcover. Where dispensing equipment is used, a drip tray must be used to ensure small spills are contained.<br>▪ Where refuelling away from the dedicated refuelling station is required, a mobile refuelling unit must be used. Appropriate ground protection such as drip trays must be used.<br>▪ If spillages occur, they should be contained and removed as rapidly as possible, with correct disposal procedures of the spilled material, as reported. Proof of disposal (waste disposal slips or waybills) should be obtained and retained on file for auditing purposes. | ▪ Monitor activities and report any non-compliance. | ▪ On-going | ▪ ECO |
| **D.13. WASTE MANAGEMENT** | | | | | |
| • Generation of waste due to disassembly of the solar facility. | Avoid substantial negative impacts at the decommissioning phase due to insufficient planning. | ▪ Measures for recycling and/or recovering of materials from the solar PV infrastructure, when obsolete, must be investigated and implemented.<br>▪ Suitable receptacles must be provided for the temporary storage of various waste types such as scrap metal and concrete, until it is removed to the nearest licensed landfill.<br>▪ Waste separation is encouraged and therefore receptacles should be labelled to reflect the different waste types. | ▪ Audit the implementation of mitigation measures recommended for the decommissioning phase. | ▪ During the decommissioning phase | ▪ ECO |

# APPENDIX A: CV OF THE EAP

## CV OF PAUL LOCHNER

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| **Name of firm** | CSIR |
| **Name of staff** | Paul Lochner |
| **Profession** | Environmental Assessment and Management |
| **Position in firm** | Manager: CSIR Environmental Management Services |
| **Nationality** | South African |

### Biographical Sketch

Paul Lochner is an environmental assessment practitioner (EAP) at the CSIR in Stellenbosch, with 30 years of experience in a wide range of environmental assessment and management studies. Paul commenced work at CSIR in 1992, after completing a B.Sc. degree in Civil Engineering and a Masters in Environmental Science, both at the University of Cape Town. His initial work at focused on wetlands and estuarine management; environmental engineering in the coastal zone; and coastal zone management plans. Since 2008, Paul has been the leader and manager of the Environmental Management Services (EMS) group within CSIR that has been at the forefront of advancing environmental assessment in South Africa. This group currently consists of approximately 10 to 20 environmental scientists, planners and engineers, with offices in Stellenbosch, Cape Town and Durban. Paul's particular experience is in environmental planning and assessment for renewable energy, electricity grid infrastructure, desalination, oil & gas, wetlands & coastal zone management, and industrial & port development. He has been closely involvement in the research and application of Strategic Environmental Assessment (SEA) in South Africa, and also has wide experience in Environmental & Social Impact Assessment, Environmental Management Programmes (EMPRs) and Environmental Screening Studies. He has been the project leader for over 40 SEAs and EIAs over the past 28 years. He also served as project leader for a suite of SEAs commissioned by the DFFE from 2014 to 2020. Paul is a Registered EAP (2019/745) with the Environmental Assessment Practitioners Association of South Africa (EAPASA).

### Tertiary Education

| Year | Degree | Institution |
|---|---|---|
| 1992 | MPhil in Environmental Science | University of Cape Town |
| 1990 | BSc in Civil Engineering awarded with Honours | University of Cape Town |

### Professional Registration

- Environmental Assessment Practitioners Association of South Africa (EAPASA), Registration Number 2019/745
- Member of the International Association for Impact Assessment South Africa (IAIAsa)

**Employment Record**

| Period | Employer | Position |
|---|---|---|
| 1992 - current | CSIR (Stellenbosch) | Environmental scientist |
| 2008 – current | CSIR (Stellenbosch) | Group Leader |

**List of Key Project Experience**

| Date | Project Description | Role | Client |
|---|---|---|---|
| 2022-ongoing | Review of permitting and governance for the Mogalakwena Mine, Limpopo (Confidential) | Project leader | Anglo American |
| 2021 - Ongoing | Environmental Performance Compliance Study for Foundries in South Africa (Phase 2) | Project reviewer | National Foundries Technology Network |
| 2021 - ongoing | Advisory services for environmental permitting for Anglo American's Carbon Neutrality and Smart Power projects in South Africa, Namibia, Botswana and Zimbabwe | Project leader | Anglo American |
| 2021 | Gemsbok EA Amendments for the 75MW x 3 solar projects at Kenhardt, Northern Cape | Project reviewer | Mulilo |
| 2021 - ongoing | Pilot Study on Permitting (Confidential) | Project leader | Anglo American |
| 2022 | Opportunities and constraints analysis for offshore wind potential for South Africa -<br><br>inventory and collation of spatial data | Project leader | World Bank |
| 2021-2022 | Environmental assessment training and support to provincial government in the independent power producer sector in the Eastern Cape province | Project leader | Dept of Economic Development, Environmental Affairs & Tourism, Eastern Cape |
| 2021 | Renewable Energy Feasibility Plan for the Atlantis Special Economic Zone, Cape Town | Lead co-leader | Atlantis Special Economic Zone |
| 2021 | Basic Assessment for 1350 MW Aardvark solar PV facilities near Copperton | Project leader | ABO Wind |
| 2020-2021 | Basic Assessments for 1575 MW Solar Photovoltaic Facilities and associated Electrical Grid Infrastructure near Touws River, Western Cape | Project leader | Veroniva |
| 2019 | Independent Expert review of the ecology study as part of the EIA and EMPR for diamond prospecting at Bloemhof Dam Nature Reserve, North West | Independent reviewer | DEA Appeals Office |

| Date | Project Description | Role | Client |
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| | province | | |
| 2018-2019 | Greater Saldanha Bay Strategic Environmental Assessment (SEA): Phase 1 Monitoring and Decision Support System | Project leader | Western Cape provincial government |
| 2018-2019 | Environmental Screening Study for a proposed 100 to 150 megalitre/day desalination facility for City of Cape Town, Phase 1: Pre-feasibility study | Project co-leader | City of Cape Town and iX Engineers |
| 2018-2019 | EIA for 150 MW wind power project in Ghana | Proposal and EIA Quality Assurance | Volta River Authority and Seljen Consult Ltd |
| 2019 | Environmental Assessment for the Kenhardt solar PV facility and electrical infrastructure (100 MW x 3), Northern Cape | Project leader | Scatec Solar Africa (Pty) Ltd |
| 2017-2019 | SEA for Wind & Solar Photovoltaic Energy development in South Africa (Phase 2) | Project reviewer | DEA & national Dept of Energy (DOE) |
| 2017-2019 | SEA for the Expansion of EGI Corridors in South Africa | Project reviewer | DEA, DOE, iGas, Eskom (national electricity utility) |
| 2017-2019 | SEA for Energy Corridors and development of a gas pipeline network for South Africa | Project reviewer | DEA, DOE, iGas, Eskom (national electricity utility) |
| 2017-2019 | SEA for Aquaculture Development in South Africa (marine and freshwater) | Project leader | DEA and national Dept of Agriculture Forestry and Fisheries (DAFF) |
| 2018 | Environmental Assessments for the Vryburg Solar project (115 MW x 3) in the Vryburg Renewable Energy Development Zone (REDZ) | Co-project manager and co-author | Veroniva & Scatec |
| 2018 | EIA for West Bank Waste Water Treatment works marine outfall pipeline, East London | Independent reviewer | WSP and Buffalo City Municipality |
| 2017-2018 | Site selection and environmental screening for a proposed 120 – 150 ML/day desalination plant for the City of Cape Town | Project leader | City of Cape Town and iX Engineers |
| 2017-2018 | EIA and EMP for Icyari Coltan Mine, Rwanda | Project reviewer | Mawarid Mining Rwanda Ltd (MMRL), UAE |
| 2016-2017 | SEA for the Square Kilometre Array radio-telescope in the Karoo, South Africa | Project leader | DEA and DST |

| Date | Project Description | Role | Client |
|---|---|---|---|
| 2016-2017 | SEA for Shale Gas Development in the Karoo region of South Africa | Project co-leader | DEA and other government departments |
| 2015-2016 | SEA for the development of Electrical Grid Infrastructure for South Africa | Project leader | DEA and Eskom (national electricity utility) |
| 2017 | EIA for the 75 MW x 12 solar photovoltaic energy projects near Dealesville, Free State | Project leader | Mainstream Renewable Power SA |
| 2014-2015 | EIA for Ishwati Emoyeni 140 MW wind energy project and supporting electrical infrastructure at Murraysburg, Western Cape | Project leader | Windlab South Africa |
| 2012-2015 | SEA for identification of renewable energy zones for wind and solar photovoltaic projects in South Africa | Project leader | DEA and other national government departments |
| 2012-2013 | Environmental Screening Study (ESS) for a desalination plant for the City of Cape Town | Project leader | City of Cape Town & WorleyParsons |
| 2012-2013 | EIA for the desalination plant for the Saldanha area | Project leader | West Coast District Municipality & WorleyParsons |
| 2012-2013 | EIA for the manganese export terminal at the Port of Ngqura and Coega Industrial Development Zone (IDZ) | Project leader | Transnet |
| 2011 – 2012 | EIA (x2) for 100 MW solar photovoltaic project at Blocuso and 100 MW solar PV project at Roode Kop in the Northern Cape | Project leader | Mainstream Renewable Power |
| 2011 – 2012 | EIA (x2) for 75 MW solar photovoltaic project at GlenThorne and 75 MW project at Valleydora, in the Free State | Project leader | Solaire Direct |
| 2010-2011 | More than 10 Basic Environmental Assessments (BAs) for solar photovoltaic projects in the Western Cape, Northern Cape, Eastern Cape and Free State | Project leader | Conducted for Dutch, German, French and South African companies |
| 2010/2011 | EIA for a 100 MW wind project at Zuurbron and a 50 MW wind project Broadlands in the Eastern Cape | Project leader | WindCurrent SA (German-based company) |
| 2010-2011 | EIAs (x4) for the proposed InnoWind wind energy projects near Swellendam, Heidelberg, Albertinia and Mossel Bay (totalling approx 210 MW), Western Cape, South Africa | Project leader | InnoWind South Africa (Pty) Ltd |
| 2009-2010 | EIA for the proposed Electrawinds wind energy facility of 45-75 MW capacity in the Coega IDZ, | Project leader | Electrawinds N.V. |

| Date | Project Description | Role | Client |
|---|---|---|---|
| | Eastern Cape | | (Belgium) |
| 2009-2010 | EIA for proposed 180 MW Jeffreys Bay wind energy project, Eastern Cape | Project Leader and co-author | Mainstream Renewable Power South Africa |
| 2009-2010 | EIA for the proposed 70 megalitre/day desalination plant at Mile 6 near Swakopmund, Namibia | Project leader | NamWater, Namibia |
| 2009 | ESS for a proposed Deepwater Port, Container Hub and Industrial Development Zone, Ghana | Project Manager | Project Management International Pty Ltd |
| 2009 | EMP for the Operational Phase of the Berg River Dam, Franschoek, South Africa | Project leader and report co-author | TCTA (national water supply utility), South Africa |
| 2006 | Environmental Impact Assessment (EIA) for extension of Port of Ngqura, Eastern Cape | Project Leader and co-author | Transnet National Port Authority |
| 2004-2005 | Environmental and Social Impact Assessment (ESIA) report for the proposed alumina refinery near Sosnogorsk, Komi Republic, Russia | Project manager and co-author | Komi Aluminium Russia, IFC, European Bank for Reconstruction & Development (EBRD) |
| 2005 | Guideline for Environmental Management Plans (EMPs) for the Western Cape province | Author | Dept of Environmental Affairs & Development Planning, Western Cape |
| 2003 | Environmental Management Plan for the Operational Phase of the wetlands and canals at Century City, Cape Town | Project leader and lead author | Century City Property Owners' Association |
| 2002 | Environmental Impact Assessment for the proposed Pechiney aluminium smelter at Coega, South Africa | Project Manager and lead author | Pechiney, France |
| 1999-2000 | Cape Action Plan for the Environment: a biodiversity Strategy and Action Plan for the Cape Floral Kingdom - legal, institutional, policy, financial and socio-economic component | Project manager and contributing writer | World Wide Fund for Nature (WWF): South Africa and Global Environment Facility (GEF) |
| 1999 | Management Plan for the coastal zone between the Eerste and Lourens River, False Bay, South Africa | Project manager and lead author | Heartland Properties and Somchem (a Division of Denel) |
| 1998 | Environmental Assessment of the Mozal Matola Terminal Development proposed for the Port of Matola, Maputo, Mozambique | Project manager and author | SNC-Lavalin-EMS |
| 1996-1997 | Strategic Environmental Assessment (SEA) for the proposed Industrial Development Zone and Harbour | SEA project manager and report | Coega IDZ Initiative |

| Date | Project Description | Role | Client |
|---|---|---|---|
| | at Coega, Port Elizabeth, South Africa | writer | Section 21 Company |
| 1995-1996 | Environmental Impact Assessment and EMP for Development Scenarios for Thesen Island, Knysna, South Africa | Project manager and report writer | Thesen and Co. |
| 1996 | Environmental Impact Assessment for the Blouvlei wetlands at Century City, Cape Town | Project manager and report writer | Ilco Homes Ltd (now Monex Ltd) |
| 1995 | Environmental Impact Assessment for the Saldanha Steel Project, South Africa | Report author and project manager | Saldanha Steel Project |
| 1994 | Environmental Impact Assessment for the upgrading of resort facilities on Frégate Island, Seychelles | Project management, co-author, process facilitator | Schneid Israelite and Partners |
| 1994 | Environmental Impact Assessment for exploration drilling in offshore Area 2815, Namibia | Project manager and lead author | Chevron Overseas (Namibia) Limited |
| 1994 | Management Plan for the Rietvlei Wetland Reserve, Cape Town | Project manager and lead author | Southern African Nature Foundation (now WWF-SA) |

**Recent Journal Publications and Peer Reviewed Papers**

A comprehensive list of publications is available on request, with a summary provided below of recent journal publications, book chapters and peer reviewed conference papers:

- Fischer D, Lochner P and Annergarn H, 2019. Evaluating the effectiveness of Strategic Environmental Assessment to facilitate renewable energy planning and improved decision-making: a South African case study, *Impact Assessment and Project Appraisal* - article ID: IAPA 1619389.
- Cape L., Retief F., Lochner P., Fischer T., and Bond A., 2018. Exploring pluralism: Different stakeholder views of the expected and realised value of strategic environmental assessment (SEA). *Environmental Impact Assessment Review*, Volume 69, March 2018, Pages 32-41.
- Cape L., Lochner P. and Fischer D., 2017. SEAs for major infrastructure programmes in SA. *IAIA17 Conference Proceedings* - 37th Annual Conference of the International Association for Impact Assessment, 4-7 April 2017 | Le Centre Sheraton Montreal | Montreal | Canada | www.iaia.org
- Schreiner, G.O., Scholes, R.J., Snyman-Van der Walt, L., De Jager, M., S, Esterhuyse., Dludla, A., Lochner, P.A., Wright, J., Atkinson, D., Hardcastle, P., Kotze, H. 2017. Advancing a participatory and science-based approach to policy formulation for shale gas development in South Africa. *In:* Eds Whitton, J., Cotton, M., Brasier, K. 2017. *Citizen and other stakeholder participation in unconventional fossil fuel land use decision-making, policy formation, regulatory practice or other governance mechanisms*. London: Routledge.
- Lochner P, Mabin M & Cape L, 2015, Recent Strategic Environmental Assessment experience in South Africa and national principles, in *IAIA16 (Japan) Conference Proceedings*.

**Language Capabilities**

| | Speaking | Reading | Writing |
|---|---|---|---|
| English | Excellent | Excellent | Excellent |
| Afrikaans | Average | Average | Average |

Environmental Assessment Practitioners Association of South Africa

Registration No. 2019/745

***Herewith certifies that***

PAUL LOCHNER

***is registered as an***

Environmental Assessment Practitioner

***Registered in accordance with the prescribed criteria of Regulation 15. (1) of the Section 24H Registration Authority Regulations (Regulation No. 849, Gazette No. 40154 of 22 July 2016, of the National Environmental Management Act (NEMA), Act No. 107 of 1998, as amended).***

Effective: 01 March 2023

Expires: 29 February 2024

*Chairperson*

*Registrar*

SAQA

# CV OF DHIVESHNI MOODLEY

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| **Name of firm** | CSIR |
| **Name of staff** | Dhiveshni Moodley |
| **Profession** | Environmental Assessment Practitioner |
| **Position in firm** | Junior Environmental Scientist and Assessment Practitioner |
| **Nationality** | South African |
| **Specialisation and Research interest:** | Geographic Information Systems; Spatial Analysis; Mapping; Environmental Assessment and Management; Strategic Environmental Assessment; Food security; Flood Vulnerability Assessment, Hydropedological Assessment. |

**Biographical Sketch**

Dhiveshni Moodley is an EAP Intern at the CSIR in Stellenbosch in the EMS group of the CSIR. Dhiveshni holds a BSc, BSc Honours (cum laude) and MSc (cum laude) degrees in Environmental Science from the University of KwaZulu-Natal. She has about two year's work experience in flood risk, hydropedological- and wetland functional assessment specialist studies, as well as conducting BAs and Scoping/EIAs in the Renewable Energy sector. Her key interest lies in using GIS analyses to apply the formation of accurate, feasible solutions to complex environmental challenges. Dhiveshni is a registered Candidate Natural Scientist (Reg. No. 1472997/19) with the SACNASP.

**Tertiary Education**

| Year | Degree | Institution |
|---|---|---|
| 2019 | MSc. Environmental Science *(Cum Laude)* | University Kwa-Zulu Natal |
| 2017 | BSc. Hons. Environmental Science *(Cum Laude)* | University Kwa-Zulu Natal |
| 2016 | BSc. Environmental Science | University Kwa-Zulu Natal |

**Professional Registration**

- South African Council for Natural Scientific Professions (SACNASP), Candidate Professional Natural Scientist (Reg. no. 1472997/19) (2019 onwards).

**Employment Record**

| Period | Employer | Position |
|---|---|---|
| **2020 – current** | Council for Scientific and Industrial Research – Environmental Management Services (EMS) | Environmental Scientist and Assessment Practitioner |
| **2020 - 2020** | South African Sugar Research Institute – Agronomy | Agronomy and GIS Research Intern. |
| **2019 - 2020** | Aeon Nexus (Pty) Ltd - Durban | Junior Environmental Consultant |

**Short Courses, Seminars and Conferences**

| Year | Course, Seminar, Conference | Institution |
|---|---|---|
| 2023 | The Roles and Responsibilities of EAPs in the EIA Process | IAIAsa |
| 2022 | Celsius 1.5: Impact Assessment and Climate Change | IAIA |
| 2020 | Conflict Resolution course | CiLLA |
| 2020 | Groundwater, Boreholes, and Water use Licenses-E-learning lecture | Ground Water Division of the Geological Society of South Africa |
| 2019 | Flood Determination Workshop | Acute Training Management |
| 2019 | Department of Water and Sanitation Hydropedology-Course 1, Digital Soils South Africa | Centre for Wildlife Management, University of Pretoria |

**List of Key Project Experience**

| Date | Project Description | Role | Client |
|---|---|---|---|
| In progress | Scoping and Environmental Impact Assessment Processes for the Proposed Development of three Wind Energy Facilities; Kwagga 1 (279 MW), Kwagga 2 (341 MW) and Kwagga 3 (204.6 MW), near Beaufort West in the Western Cape Province | Project Manager | ABO Wind renewable energies (Pty) Ltd |
| In progress | Basic Assessment Processes for the Proposed Development of seven Solar Photovoltaic (PV) Energy Facilities; namely Rinkhals 1 (30 MW), Rinkhals 2 (30 MW), Rinkhals 3 (150 MW), Rinkhals 4 (150 MW), Rinkhals 5 (150 MW), Rinkhals 6 (150 MW) and Rinkhals 7 (150 MW), near Kimberley in the Free State and Northern Cape Provinces | Project Officer | ABO Wind renewable energies (Pty) Ltd |
| December 2019 | The KwaDukuza Mall and Mixed-Use Precinct<br><br>Wetland Functional Update Assessment, iLembe District Municipality,<br><br>KwaZulu-Natal | Project member-Wetland delineation and assessment inputs | Wallace & Green Consulting (Pty) Ltd |
| July 2019 | Specialist desktop hydropedology assessment for the Ballito Hills Development, eThekwini Municipality, KwaZulu-Natal | Project member-Hydropedological assessment | Triplo4 Sustainable Solutions (Pty) Ltd |
| July 2019 | Specialist desktop hydropedology assessment for the Umhlali Development, eThekwini Municipality, KwaZulu-Natal | Project member-Hydropedological assessment | Triplo4 Sustainable Solutions (Pty) Ltd |

| Date | Project Description | Role | Client |
|---|---|---|---|
| June 2019 | Specialist desktop hydropedology assessment for the Sheffield Waste Water Treatment Works, eThekwini Municipality, KwaZulu-Natal | Project member-Hydropedological assessment | Triplo4 Sustainable Solutions (Pty) Ltd |

**Software Skills**

- ESRI Arcmap
- Microsoft Office (Word, Excel, PowerPoint)
- Google Earth
- QGIS
- ERDAS IMAGINE
- Pix4Dmapper

**Honours and Awards**

- Allan Gray Achievement Award nominee (2017)
- Golden Key International Academic Honours Association (2016 – current)

**Language Capabilities**

| | Speaking | Reading | Writing |
|---|---|---|---|
| English | Excellent | Excellent | Excellent |

# APPENDIX B: ROLES AND RESPONSIBILITIES

| Responsible Person(s) | Role and Responsibilities |
|---|---|
| Developer's Project Manager (DPM) | Role<br>The Project Developer is accountable for ensuring compliance with the EMPr and any conditions of approval from the competent authority (CA). Where required, an environmental control officer (ECO) must be contracted by the Project Developer to objectively monitor the implementation of the EMPr according to relevant environmental legislation, and the conditions of the environmental authorisation (EA). The Project Developer is further responsible for providing and giving mandate to enable the ECO to perform responsibilities, and he must ensure that the ECO is integrated as part of the project team while remaining independent.<br><br>Responsibilities<br>- Be fully conversant with the conditions of the EA;<br>- Ensure that all stipulations within the EMPr are communicated and adhered to by the Developer and its Contractor(s);<br>- Issuing of site instructions to the Contractor for corrective actions required;<br>- Monitor the implementation of the EMPr throughout the project by means of site inspections and meetings. Overall management of the project and EMPr implementation; and<br>- Ensure that periodic environmental performance audits are undertaken on the project implementation. |
| Developer Site Supervisor (DSS) | Role<br>The DSS reports directly to the DPM, oversees site works, liaises with the contractor(s) and the ECO. The DSS is responsible for the day to day implementation of the EMPr and for ensuring the compliance of all contractors with the conditions and requirements stipulated in the EMPr.<br><br>Responsibilities<br>- Ensure that all contractors identify a contractor's Environmental Officer (cEO);<br>- Must be fully conversant with the conditions of the EA. Oversees site works, liaison with Contractor, DPM and ECO;<br>- Must ensure that all landowners have the relevant contact details of the site staff, ECO and cEO;<br>- Issuing of site instructions to the Contractor for corrective actions required;<br>- Will issue all non-compliances to contractors; and<br>- Ratify the Monthly Environmental Report. |
| Environmental Control Officer (ECO) | Role<br>The ECO should have appropriate training and experience in the implementation of environmental management specifications. The primary role of the ECO is to act as an independent quality controller and monitoring agent regarding all environmental concerns and associated environmental impacts. In this respect, the ECO is to conduct periodic site inspections, attend regular site meetings, pre-empt problems and suggest mitigation and be available to advise on incidental issues that arise. The ECO is also required to conduct |

| Responsible Person(s) | Role and Responsibilities |
|---|---|
| | compliance audits, verifying the monitoring reports submitted by the cEO. The ECO provides feedback to the DSS and Project Manager regarding all environmental matters. The Contractor, cEO and dEO are answerable to the Environmental Control Officer for non-compliance with the Performance Specifications as set out in the EA and EMPr.<br><br>The ECO provides feedback to the DSS and Project Manager, who in turn reports back to the Contractor and potential and Registered Interested &Affected Parties' (RI&AP's), as required. Issues of non-compliance raised by the ECO must be taken up by the Project Manager, and resolved with the Contractor as per the conditions of his contract. Decisions regarding environmental procedures, specifications and requirements which have a cost implication (i.e. those that are deemed to be a variation, not allowed for in the Performance Specification) must be endorsed by the Project Manager. The ECO must also, as specified by the EA, report to the relevant CA as and when required.<br><br><u>Responsibilities</u><br>The responsibilities of the ECO will include the following:<br>- Be aware of the findings and conclusions of all EA related to the development;<br>- Be familiar with the recommendations and mitigation measures of this EMPr;<br>- Be conversant with relevant environmental legislation, policies and procedures, and ensure compliance with them;<br>- Undertake regular and comprehensive site inspections / audits of the construction site according to the generic EMPr and applicable licenses in order to monitor compliance as required;<br>- Educate the construction team about the management measures contained in the EMPr and environmental licenses;<br>- Compilation and administration of an environmental monitoring plan to ensure that the environmental management measures are implemented and are effective;<br>- Monitoring the performance of the Contractors and ensuring compliance with the EMPr and associated Method Statements;<br>- In consultation with the Developer Site Supervisor order the removal of person(s) and/or equipment which are in contravention of the specifications of the EMPr and/or environmental licenses;<br>- Liaison between the DPM, Contractors, authorities and other lead stakeholders on all environmental concerns;<br>- Compile a regular environmental audit report highlighting any non-compliance issues as well as satisfactory or exceptional compliance with the EMPr;<br>- Validating the regular site inspection reports, which are to be prepared by the contractor Environmental Officer (cEO);<br>- Checking the cEO's record of environmental incidents (spills, impacts, legal transgressions etc.) as well as corrective and preventive actions taken;<br>- Checking the cEO's public complaints register in which all complaints are recorded, as well as action taken;<br>- Assisting in the resolution of conflicts;<br>- Facilitate training for all personnel on the site – this may range from carrying out the training, to reviewing the training programmes of the Contractor;<br>- In case of non-compliances, the ECO must first communicate this to the Senior Site Supervisor, who has the power to ensure this matter is addressed. Should no action or insufficient action be taken, the ECO may report this matter to the authorities as non- |

| Responsible Person(s) | Role and Responsibilities |
|---|---|
| | compliance;<br>- Maintenance, update and review of the EMPr;<br>- Communication of all modifications to the EMPr to the relevant stakeholders. |
| developer Environmental Officer (dEO) | <u>Role</u><br>The dEOs will report to the Project Manager and are responsible for implementation of the EMPr, environmental monitoring and reporting, providing environmental input to the Project Manager and Contractor's Manager, liaising with contractors and the landowners as well as a range of environmental coordination responsibilities.<br><br><u>Responsibilities</u><br>- Be fully conversant with the EMPr;<br>- Be familiar with the recommendations and mitigation measures of this EMPr, and implement these measures;<br>- Ensure that all stipulations within the EMPr are communicated and adhered to by the Employees, Contractor(s) ;<br>- Confine the development site to the demarcated area;<br>- Conduct environmental internal audits with regards to EMPr and authorisation compliance (on cEO);<br>- Assist the contractors in addressing environmental challenges on site;<br>- Assist in incident management:<br>- Reporting environmental incidents to developer and ensuring that corrective action is taken, and lessons learnt shared;<br>- Assist the contractor in investigating environmental incidents and compile investigation reports;<br>- Follow-up on pre-warnings, defects, non-conformance reports;<br>- Measure and communicate environmental performance to the Contractor;<br>- Conduct environmental awareness training on site together with ECO and cEO;<br>- Ensure that the necessary legal permits and / or licenses are in place and up to date;<br>- Acting as Developer's Environmental Representative on site and work together with the ECO and contractor. |
| Contractor | <u>Role</u><br>The Contractor appoints the cEO and has overall responsibility for ensuring that all work, activities, and actions linked to the delivery of the contract are in line with the EMPr and that Method Statements are implemented as described. External contractors must ensure compliance with this EMPr while performing the onsite activities as per their contract with the Project Developer. The contractors are required, where specified, to provide Method Statements setting out in detail how the impact management actions contained in the EMPr will be implemented during the development or expansion of substation infrastructure for the transmission and distribution of electricity activities.<br><br><u>Responsibilities</u><br>- project delivery and quality control for the development services as per appointment;<br>- employ a suitably qualified person to monitor and report to the Project Developer's appointed person on the daily activities on-site during the construction period; |

| Responsible Person(s) | Role and Responsibilities |
|---|---|
| | - ensure that safe, environmentally acceptable working methods and practices are implemented and that equipment is properly operated and maintained, to facilitate proper access and enable any operation to be carried out safely;<br>- attend on site meeting(s) prior to the commencement of activities to confirm the procedure and designated activity zones;<br>- ensure that contractors' staff repair, at their own cost, any environmental damage as a result of a contravention of the specifications contained in EMPr, to the satisfaction of the ECO. |
| contractor Environmental Officer (cEO) | <u>Role</u><br>Each Contractor affected by the EMPr should appoint a cEO, who is responsible for the on-site implementation of the EMPr (or relevant sections of the EMPr). The Contractor's representative can be the site agent; site engineer; a dedicated environmental officer; or an independent consultant. The Contractor must ensure that the Contractor's Representative is suitably qualified to perform the necessary tasks and is appointed at a level such that she/he can interact effectively with other site Contractors, labourers, the Environmental Control Officer and the public. As a minimum the cEO shall meet the following criteria:<br><br><u>Responsibilities</u><br>- Be on site throughout the duration of the project and be dedicated to the project;<br>- Ensure all their staff are aware of the environmental requirements, conditions and constraints with respect to all of their activities on site;<br>- Implementing the environmental conditions, guidelines and requirements as stipulated within the EA, EMPr and Method Statements;<br>- Attend the Environmental Site Meeting;<br>- Undertaking corrective actions where non-compliances are registered within the stipulated timeframes;<br>- Report back formally on the completion of corrective actions;<br>- Assist the ECO in maintaining all the site documentation;<br>- Prepare the site inspection reports and corrective action reports for submission to the ECO;<br>- Assist the ECO with the preparing of the monthly report; and<br>- Where more than one Contractor is undertaking work on site, each company appointed as a Contractor will appoint a cEO representing that company. |

# APPENDIX C: CHANCE FOSSIL FIND PROTOCOL FOR PALAEONTOLOGICAL RESOURCES

| **CHANCE FOSSIL FINDS PROTOCOL: Proposed Padloper PV Facilities and Associated Infrastructure near Murraysburg** | |
|---|---|
| **Province & region:** | Northern Cape: Pixley Ka Seme District |
| **Responsible Heritage Resources Agency** | SAHRA (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Phone: +27 (0)21 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za). |
| **Rock unit(s)** | Mostly underlain by the Balfour Formation (Adelaide Subgroup, Beaufort Group, Karoo Supergroup) with a small portion underlain by Jurassic Dolerite |
| **Potential fossils** | Potentially fossiliferous drainage lines filled with scree and debris. |
| **Environmental Control Officer (ECO) protocol** | 1. Once alerted to fossil occurrence(s): alert site foreman, stop work in area immediately (*N.B.* safety first!), safeguard site with security tape / fence / sand bags if necessary.<br>2. The person who made the find must immediately report the find to his/her direct supervisor which in turn must report the find to his/her manager and the ESO or Site Manager. The ESO or Site Manager must report the find to the relevant Heritage Agency (South African Heritage Research Agency, SAHRA). (Contact details included above).<br>3. The information to the Heritage Agency must include photographs of the find from various angles as well as the GPS co-ordinates.<br>4. A preliminary report must be submitted to the Heritage Agency within 24 hours of the find and must include the following: 1) date of the find; 2) a description of the discovery and a 3) description of the fossil and its context (depth and position of the fossil), GPS co-ordinates.<br>5. Photographs (the more the better) of the discovery must be of high quality, in focus, accompanied by a scale. It is also important to have photographs of the vertical section (side) where the fossil was found.<br>6. Upon receipt of the preliminary report, the Heritage Agency will inform the ESO (or Site Manager) whether a rescue excavation or rescue collection by a palaeontologist is necessary.<br>7. The site must be secured to protect it from any further damage. No attempt should be made to remove material from their environment. The exposed finds must be stabilized and covered by a plastic sheet or sand bags. The Heritage agency will also be able to advise on the most suitable method of protection of the find.<br>8. If the fossil cannot be stabilized the fossil may be collected with extreme care by the ESO. Fossils finds must be stored in tissue paper and in an appropriate box while due care must be taken to remove all fossil material from the rescue site.<br>9. Once the Heritage Agency has issued the written authorization, the developer may continue with the development on the affected area. |
| **Specialist palaeontologist** | Record, describe and judiciously sample fossil remains together with relevant contextual data (stratigraphy / sedimentology / taphonomy). Ensure that fossils are curated in an approved repository (*e.g.* museum / university / Council for Geoscience collection) together with full collection data. Submit Palaeontological Mitigation report to Heritage Resources Agency. Adhere to best international practice for palaeontological fieldwork and Heritage Resources Agency minimum standards. |

# APPENDIX D: BATTERY ENERGY STORAGE SYSTEM RECOMMENDATIONS

## CONSTRUCTION PHASE

This phase applies to:

FOR SOLID STATE BESS – Excluding commissioning which involves starting and testing the installed equipment, i.e. powering up the batteries.
FOR REDOX FLOW BESS - Excluding commissioning i.e. filling the system with electrolyte, testing and initial powerup of the batteries

| Receptor | Description | Preventative and Mitigative Measures |
|---|---|---|
| Human Health - chronic exposure to toxic chemical or biological agents | Causes - Construction materials such as cement, paints, solvents, welding fumes, truck fumes etc.<br>Consequences - Employee / contractor illness. | **The following is applicable to both Solid State Lithium Ion and Redox Flow BESS:**<br>• The construction phase will be managed according to all the requirements of the Occupational Health and Safety Act 85 of 1993 specifically the Construction Regulations.<br>• SHEQ policy in place.<br>• A detailed construction Risk Assessment to be undertaken prior to work.<br>• SHE procedure in place.<br>• PPE to be specified.<br>• SHE appointees in place.<br>• Contractor's safety files in place and up to date.<br>• All necessary health controls/ practices to be in place, e.g., ventilation of welding and painting areas.<br>• SHE monitoring and reporting programs in place.<br>• Emergency response plan to be in place prior to beginning construction and to include aspects such as appointment of emergency controller, provision of first aid, first responder contact numbers. |
| Human Health - exposure to noise | Causes - Drilling, piling, generators, air compressors.<br>Consequences - Adverse impact on hearing of workers.<br>Possible nuisance factor in near-by areas. | **The following is applicable to both Solid State Lithium Ion and Redox Flow BESS:**<br>• OHS Act Noise Induced Hearing Loss Regulations.<br>• Health Risk Assessment to determine if equipment noise exceeds 85dB at workstation and 61dB at boundary of the site.<br>• Employees to be provided with hearing protection if working near equipment that exceeds the noise limits. |
| Human Health - exposure to temperature extremes and/or humidity | Causes - Heat during the day.<br>Cold in winter.<br>Consequence - Heat stroke.<br>Hypothermia. | **The following is applicable to both Solid State Lithium Ion and Redox Flow BESS:**<br>• Construction site facilities to comply with Occupational Health and Safety Act 85 of 1993, specifically the thermal, humidity, lighting and ventilation requirements of the Environmental Regulations for Workplaces.<br>• Adequate potable water for employees to be provided during all phases of the project.<br>• Bore hole, bowser and tank or small water treatment plant may be required to provide potable water for the BESS installation staff during all phases of the project. Geohydrology Assessment has been conducted during the BA to assess the impact of the use of groundwater. |
| Human Health - exposure to psychological stress | Causes - Large projects bring many contractor workers into a small, isolated community.<br>Consequences – Lack of sufficient accommodation, entertainment etc. Increase in alcohol abuse, violence | **The following is applicable to both Solid State Lithium Ion and Redox Flow BESS:**<br>• Refer to the Socio-Economic Specialist Study undertaken as part of the BA for this project. |
| Human Health – exposure to ergonomic stress | Causes – Lifting heavy equipment.<br>Awkward angles during construction.<br>Consequences – Back and other injuries. | **The following is applicable to both Solid State Lithium Ion and Redox Flow BESS:**<br>• Training in lifting techniques.<br>• Ensure that despite the isolated location all the necessary equipment is available (and well maintained) during construction. Otherwise, employees may revert to unsafe practices. Ensure this is in place prior to project commencement.<br>• Ensure first aid provision on site. |
| Human and Equipment Safety - exposure to fire radiation | Causes –<br>Involvement in an external fire.<br>Fire involving fuels used in construction vehicles or vehicles themselves (e.g., tyre fire).<br>Fire due to uncontrolled welding or other hot-work<br>Consequences - Injuries due to radiation especially amongst first responders and bystanders. Fatalities | **The following is applicable to both Solid State Lithium Ion and Redox Flow BESS:**<br>• Fuels stored on site in dedicated, demarcated and bunded areas.<br>• Suitable fire-fighting equipment on site near source of fuel, e.g., diesel tank, generators, mess, workshops etc.<br>• The company responsible for the facility at this stage is to have: 1. Emergency plan to be in place prior to commencement of construction. 2. Fuel spill containment procedures and equipment to be in place. 3. Hot-work permit and management system to be in place. |

| Receptor | Description | Preventative and Mitigative Measures |
|---|---|---|
| | unlikely from the heat radiation as not highly flammable nor massive fire. | |
| Human and Equipment Safety - exposure to fire radiation | Causes - Solid state battery containers damaged on route e.g., dropped in port (drops do happen about 1/2000 containers) and importing possibly up to 700 containers for the site. With this it is possible, although unlikely, that one will be dropped, traffic accident on-route. Involvement in an external fire e.g., at the port or on route.<br><br>Consequences – Injuries due to radiation especially amongst first responders and bystanders. Fatalities unlikely from the heat radiation as not highly flammable nor massive fire (refer to noxious smoke in Appendix A of the BESS Risk Assessment for the major impact). | **The following is applicable to Solid State Lithium Ion BESS:**<br>• Solid state battery design includes abuse tests such as drop test, impact, rapid discharge etc.<br>• Propagation tests for systems, e.g., heat insulating materials between cells/modules.<br>• Factory acceptance test prior to prior to leaving manufacture.<br>• Batteries are usually stored at 50% charge to prolong life but may be shipped fully discharged. This level of detail should be understood so as to assess the risk during transport and storage.<br>• The company responsible for the battery installation should ensure suitably competent transport companies are appointed. The company responsible for transportation should ensure: 1) Compliance with National Road Traffic Act Regulation 8 – dangerous goods. 2) Port Authorities should be alerted to the overall project and the hazardous nature of the contents of battery containers being imported. Note. If, as per one of the typical suppliers (Tesla) indications, the containers are classified as IMDG Class 9 – the containers will not receive any special care in the ports and may be stored next to flammables. Port emergency response in particular need training on mitigating battery hazards.<br>• Prior to bringing any containers into the country, the company responsible for the battery installation (possibly via appointed contractors) should ensure that an emergency response plan is in place for the full route from the ship to the site. Drivers trained in the hazards of containerized batteries.<br>• The Emergency response plan must determine and address:<br>○ What gases would be released in a fire and are there inhalation hazards.<br>○ Extinguishing has two important elements, put out fire and to provide cooling. Different approaches may be needed for small fire – e.g., put out, and for large fires e.g., cool with copious quantities of water. Note inert gases and foam may put out the initial fire but fail to control thermal runaway or to cool the batteries resulting in reignition.<br>○ What initial fire extinguishing medium should be used.<br>○ Whether there are any secondary gases or residues from use of extinguishers.<br>○ If water is appropriate, determine if the system needs outside connections to sprinklers inside the container.<br>○ First responders need to know what media to use, especially if water totally unsuitable and if there are no connection points for water etc.<br>○ Must the container be left unopened or opened.<br>○ PPE to be specified including possible exposure to chemicals and fumes as well as radiate heat.<br>○ Containment of residues/water/damaged equipment.<br>○ Suitable safe making and disposal plan for after the event i.e. how do responders deal with partially charged damage units, contaminated surfaces (e.g., HF residues). |
| Human and Equipment Safety - exposure to explosion over pressures | Causes - With solid state lithium containers, flammable gases generated by thermal run away reach explosive limits. Ignition on hot surfaces, static.<br>Consequences - Potential fatalities amongst first responders.<br>Damage to container, transport truck or other nearby items, e.g., other container in the port. | **The following is applicable to Solid State Lithium Ion BESS:**<br>• During transport this is only likely to happen due to possible inappropriate emergency response, e.g., opening containers when they may be the type that should be left to burn out.<br>• For simplicity one transport route would be preferable. The route needs to be assessed in terms of responding local services, rest places for drivers, refuelling if required, break down services available etc.<br>• Once an import route has been chosen, e.g., N10 from Port of Ngqura, then the appointed transport company should ensure key emergency services on route could be given awareness training in battery fire/accident response. Emergency response planning and training referred to above may be important for key locations such as the mountain passes / tunnels. |
| Human and Equipment Safety - exposure to acute toxic chemical and biological agents | Causes Human pathogens and diseases, sewage, food waste.<br>Snakes, insects, wild and domesticated animals and harmful plants.<br>Consequences - Illness and at worst without mitigation, possibly extending to fatalities.<br>Effects can vary from discomfort to fatalities for venomous snakes or bee swarms etc. | **The following is applicable to both Solid State Lithium Ion and Redox Flow BESS:**<br>• All necessary good hygiene practices to be in place, e.g., provision of sanitation facilities, eating areas, infectious disease controls.<br>• Policies and practice for dealing with known vectors of disease such as AIDS, TB, COVID 19 and others.<br>• Awareness training for persons on site, safety induction to include animal hazards. First aid and emergency response to consider the necessary anti-venom, anti-histamines, topical medicines etc.<br>• Due to isolated locations some distance from town, the ability to treat with anti-venom and extreme allergic reactions on site is critical to mitigate the impacts. |
| Human and Equipment Safety - exposure to acute toxic chemical and | Causes - Damaged solid-state batteries release fumes, leak electrolyte, are completely broken exposing hazardous chemicals. Thermal runaway and hazardous fumes released. | **The following is applicable to Solid State Lithium Ion BESS:**<br>• Appointed transport company to ensure transport in accordance with Regulation 8 of the National Road Traffic Act 93 of 1996, Dangerous Goods. Not permitted to transport prescribed goods in manner not consistent with the prescriptions, e.g., consignor and consignee responsibilities. |

| Receptor | Description | Preventative and Mitigative Measures |
|---|---|---|
| biological agents | Consequences - Impacts can vary from mild skin irritation from exposure to small leaks to serious corrosive burns or lung damage. | • Prescription found in SANS 10228/29 and international codes for battery transport etc. Transportation of BESS components in sealed packages that are kept upright, protected from movement damage etc.<br>• Also packaged to ensure no short-circuiting during transport.<br>• Transport to prevent excessive vibration considerations as battery internal components may be damaged leading to thermal run-away during commissioning.<br>• Pre-assembled containers will most likely be supplied. These will be fitted with the necessary protective measures by the supplier considering marine and road transport as well as lifting, setting down etc.<br>• Route selection to consider possible incidents along the way and suitable response, e.g., satellite tracking, mobile communication, 24/7 helpline response.<br>• Standard dangerous goods requirements for Hazmat labels, Transport Emergency Data i.e. Trem cards, driver trained in the hazards of the load.<br>• Likelihood similar to fire above. |
| Human and Equipment Safety - exposure to violent release of kinetic or potential energy | Causes - Construction moving equipment, heavy loaded, elevated loads, working at heights<br>Consequences - Injury or possibly fatality.<br>Damage to equipment.<br>Delays in starting the project, financial losses | **The following is applicable to both Solid State Lithium Ion and Redox Flow BESS:**<br>• The construction phase will be managed according to all the requirements of the Occupational Health and Safety Act 85 of 1993 specifically the Construction Regulations.<br>• SHEQ policy in place.<br>• A detailed construction Risk Assessment to be undertaken prior to work.<br>• SHE procedure in place.<br>• PPE to be specified.<br>• SHE appointees in place.<br>• Contractors safety files in place and up to date.<br>• SHE monitoring and reporting programs in place.<br>• Standard construction site rules regarding traffic, reversing sirens, rigging controls, cordoning off excavations etc.<br>• Civil and building structures to comply with the National Building Regulations and building Standards Act 103 of 1977, SANS 10400 and other relevant codes.<br>• Other constructions such as roads, sewers etc also to comply with relevant SANS standards. All normal procedures for working at heights, hot work permits, confined space entry, cordon off excavations etc to be in place before construction begins.<br>• Emergency response plan to be in place before construction begins. |
| Human and Equipment Safety - exposure to electromagnetic waves | Causes - Use of electrical machines, generators etc.<br>Hot dry area static generation is highly likely.<br>Lightning strike.<br>Consequences - Electrocution.<br>Ignition and burns. Injury and death.<br>Damage to electrical equipment. | **The following is applicable to both Solid State Lithium Ion and Redox Flow BESS:**<br>• Standard maintenance of condition of electrical equipment and safe operating instructions.<br>• Ability to shut off power to systems in use on site.<br>• If persons are decanting fuels or dealing with other highly flammable materials care should be taken regarding possible static discharge, and installations to be suitably designed and maintained.<br>• Outside work must be stopped during thunderstorms.<br>• Lighting conductors may be required for the final installation, to be confirmed during design phase.<br><br>**The following is applicable to Redox Flow BESS:**<br>• Risk to and from electricity transmission pylons, suggest separation at least the pylon fall height, e.g. >10m for 10m tall pylons. |
| Environment - emissions to air | Causes - Dust from construction and generally hot dry area.<br>Consequences - Adverse impact on employee health. | **The following is applicable to both Solid State Lithium Ion and Redox Flow BESS:**<br>• May need to use dampening on roads etc. as per normal construction practices.<br>• May need PPE (dust masks) for specific construction workers. |
| Environment - emissions to water | Causes - Diesel for equipment, paints and solvents.<br>Transformer oil spills.<br>Sewage and kitchen/mess area wastewater.<br>Consequences - Environmental damage, particularly to the surface and underground water in the area. | **The following is applicable to both Solid State Lithium Ion and Redox Flow BESS:**<br>• Normal construction site practices for preventing and containing fuels/paint/oil etc spills.<br>• Bunding under any temporary tanks, curbing under truck offloading areas and sealed surfaces (e.g., concrete) under truck parking area is particularly important.<br>• Spill clean-up procedures to be in place before commencing construction.<br>• Sewage and any kitchen liquids - containment and suitable treatment/disposal |
| Environment - emissions to earth | Causes - Mess area and other solid waste.<br>Consequences - Environmental damage. | **The following is applicable to both Solid State Lithium Ion and Redox Flow BESS:**<br>• There will be packaging materials that will need to be disposed of after the entire system is connected and commissioned as well as after regular maintenance. |

| Receptor | Description | Preventative and Mitigative Measures |
|---|---|---|
| | | • There will need to be waste segregation (e.g., electronic equipment, chemicals) and management on the site. |
| Environment - waste of resources e.g., water, power etc | Causes - Water usage not controlled.<br>Battery containers damaged.<br>Consequences - Delays. | **The following is applicable to both Solid State Lithium Ion and Redox Flow BESS:**<br>• Water usage to be monitored on site during construction.<br>• Handling protocols to be provided by battery supplier.<br>• Water management plan and spill containment plans to be in place.<br><br>**The following is applicable to Solid State Lithium Ion BESS:**<br>• End of Life plan needs to be in place before any battery containers enter the country as there may be damaged battery unit from day 1. |
| Public - Aesthetics | Causes - Bright surfaces reflecting light.<br>Tall structures in a flat area.<br>Consequences - Irritation. | **The following is applicable to both Solid State Lithium Ion and Redox Flow BESS:**<br>• Refer to the visual impact assessment undertaken as part of the BA. |
| Investors - Financial | Causes - Defective technology.<br>Extreme project delays.<br>Consequences - Financial loss | **The following is applicable to both Solid State Lithium Ion and Redox Flow BESS:**<br>• Design by experienced contractors using internationally recognized and proven technology.<br>• Project management with deviation monitoring. |
| Employees and investors - Security | Causes - On route, potential hi-jacking of valuable but hazardous load.<br>On site, theft of construction equipment and battery installation facilities.<br>Civil unrest or violent strike by employees.<br>Consequences - Theft.<br>Injury to burglars.<br>Damage to equipment possibly setting off thermal runaway. | **The following is applicable to both Solid State Lithium Ion and Redox Flow BESS:**<br>• Fencing around electrical infrastructure to SANS standard and Eskom Guidelines.<br>• The hazardous nature of the electrical and battery equipment should be clearly indicated – e.g., Skull and Cross Bones or other signs.<br>• Isolated location both helps and hinders security.<br>• Night lighting to be provided both indoors and outdoors where necessary. |
| Emergencies | Causes - Fires, explosions, toxic smoke, large spills, traffic accidents, equipment/structural collapse.<br><br>Inadequate emergency response to small event leads to escalation.<br>Consequences - Injuries turn to fatalities, small losses become extended down time. | **The following is applicable to both Solid State Lithium Ion and Redox Flow BESS:**<br>• All safety measures listed above.<br>• Emergency procedures need to be practiced prior to commencement of construction.<br><br>**The following is applicable to Solid State Lithium Ion BESS:**<br>• If batteries are stored at 50% charge, thermal run away can happen while in storage on site waiting for installation. In addition, if involved in an external fire thermal run away can happen even with uncharged batteries. Except during shipping, ideally the units should not be stored any closer to each other than they would be in the final installation so that propagation is prevented, i.e. laydown area needs to be considered.<br>• The company in charge of the containers at each stage in the transport process needs to be very clear so that responsibility for the integrity of the load and protection of the persons involved in transfer and coordination of emergency response on-route. E.g., if purchased from Tesla where does hand over occur to the South African contractor / owner, at the factory door in USA, at the port in RSA, at the site fence. For example, who will be accountable if there's thermal runway event on a truck with a container that stops in a small town for driver refreshments. |
| Investors - Legal | Causes - Battery field is evolving quickly with new guides, codes and regulations happening at the same time as evolving technology.<br>Consequences - Unknown hazards manifest due to using "cheaper supplier or less developed technology". | **The following is applicable to both Solid State Lithium Ion and Redox Flow BESS:**<br>• Use only internationally reputable battery suppliers who comply with all known regulations/guideline at the time of purchasing.<br>• Where reasonably practicable ensure only "state of the art" battery systems are used and not old technologies prone to fires/explosions etc. |

**OPERATIONAL PHASE**

Many potential problems manifest during the commissioning phase when units are first powered up to test functionality. This phase is critical and all controls, procedures, mitigation measures etc. that would be in place for full operation should be in place before commissioning commences.

This phase applies to:

FOR SOLID STATE BESS – Including Commissioning – i.e. initial testing of the systems and first powerup of batteries.
FOR REDOX FLOW BESS - Including Commissioning - e.g. filling the electrolyte into the tanks, testing the electrics, powering up the battery systems

| Receptor | Description | Preventative and Mitigative Measures |
|---|---|---|
| Human Health - chronic exposure to toxic chemical or biological agents | Causes - Operation and maintenance materials spare parts, paints, solvents, welding fumes, transformers oils, lubricating oils and greases etc.<br>Consequences - Occupational illness. | **The following is applicable to both Solid State Lithium Ion and Redox Flow BESS:**<br>• The operation and maintenance phase will be managed according to all the requirements of the Occupational Health and Safety Act 85 of 1993.<br>• SHEQ policy in place.<br>• A detailed Risk Assessment of all normal operating and maintenance activities on site to be compiled, and form the basis of operating instructions, prior to commencing commissioning.<br>• SHE procedure in place, e.g., PPE specified, management of change, integrity monitoring.<br>• SHE appointees in place.<br>• Training of staff in general hazards on site.<br>• All necessary health controls/ practices to be in place, e.g., ventilation of confined areas, occupational health monitoring if required and reporting programs in place.<br>• Emergency response plan for full operation and maintenance phase to be in place prior to beginning commissioning and to include aspects such as:<br>- appointment of emergency controller,<br>- emergency isolation systems for electricity,<br>- -emergency isolation and containment systems for electrolyte,<br>- provision of PPE for hazardous materials response,<br>- provision of emergency facilities for staff at the main office building,<br>- provision of first aid facilities,<br>• - first responder contact numbers etc. |
| Human Health - chronic exposure to toxic chemical or biological agents | Causes - Compromised battery compartments vapours accumulate in the containers, solids/liquids on surfaces. Maintenance of battery components, corrosive and mildly toxic liquid on surfaces.<br>Consequences - Dermatitis, skin /eye/lung irritation. | **The following is applicable to Solid State Lithium Ion BESS:**<br>• Solid state batteries sealed, individual batteries in modules which are also sealed, pre-packed in the container.<br>• Possible detectors with local alarms if regulated occupational exposure limits are exceeded etc prior to entry for inspection of battery containers.<br>• There needs to be careful thought given to procedures to be adopted before entering into the BESS or a container particularly<br>• after a Battery management System (BMS) shut down where there may be flammable or toxic gases present, a fire etc.<br><br>**The following is applicable to Redox Flow BESS:**<br>• VRFB Batteries facilities normally within buildings but may be containerized<br><br>**The following is applicable to both Solid State Lithium Ion and Redox Flow BESS:**<br>• Maintenance procedures will be in place should equipment need to be opened, e.g., pumps drained and decontaminated prior to repair in workshop etc.<br>• PPE will be specified for handling battery parts and other equipment on site.<br>• Training of staff in hazards of chemicals on site.<br>• Labelling of all equipment.<br>• Confined space entry procedures if entering tanks.<br>• Safety Data Sheets (SDSs) to be available on site.<br>• Operating manuals to be provided including start-up, shut-down, steady state, monitoring requirements.<br>• Maintenance manuals with make safe, decontamination and repair procedures.<br>• Proposed maintenance schedules e.g., checklists for weekly, monthly, annual etc.<br>• Provided portable equipment for calibration and for testing/verification of defective equipment, e.g., volt/current meters, infrared camera |
| Human Health - exposure to noise | Causes - Moving parts inside containers, buildings, pumps, compressors, cooling systems etc.<br>Consequences - Adverse impact on hearing of workers. Nuisance factor at near-by residences or other activities. | **The following is applicable to both Solid State Lithium Ion and Redox Flow BESS:**<br>• Design to ensure continuous noise does not exceed 85dB within the facilities or at any other location on site or 61 dB at the site boundary, e.g., emergency generator, air compressor etc.<br>• Employees to be provided with hearing protection if working near equipment that exceeds the noise limits. |

| Receptor | Description | Preventative and Mitigative Measures |
|---|---|---|
| Human Health - exposure to temperature extremes and/or humidity | Causes - Heat during the day.<br>Batteries generate heat within enclosed building / containers.<br>Cold in winter.<br>Night work requires lighting.<br><br>Consequences - Heat stroke.<br>Hypothermia. | **The following is applicable to Solid State Lithium Ion BESS:**<br>• Ensure containers are temperature controlled as required to remain within the optimal battery operating temperature range.<br>• Lighting to be provided inside any buildings, inside the containers, possibly linked to the door opening and outdoors where necessary.<br><br>**The following is applicable to Redox Flow BESS:**<br>• Night work is likely for VRFB. Suitable lighting to be provided including emergency lighting for safe building exit in the event of power failure.<br><br>**The following is applicable to both Solid State Lithium Ion and Redox Flow BESS:**<br>• Building and container facilities to comply with Occupational Health and Safety Act 85 of 1993 specifically the thermal, humidity, lighting and ventilation requirements of the Environmental Regulations for Workplaces.<br>• Adequate potable water to be provided during all phases of the project.<br>• Suitable lighting to be provided including emergency lighting for safe building exit in the event of power failure.<br>• PPE for operations and maintenance staff to be suitable for the weather conditions. |
| Human Health - exposure to psychological stress | Causes - Isolated workstation and monotonous repetitive work.<br>Consequences - Low performance, system productivity suffers. | **The following is applicable to both Solid State Lithium Ion and Redox Flow BESS:**<br>• Staff rotation to other activities within the site may be necessary.<br>• Performance monitoring of inspections / maintenance tasks in particular will be necessary. |
| Human Health - exposure to ergonomic stress | Causes - Lifting heavy equipment.<br>Awkward angles during maintenance, stretching reaching to high level and bending to low level.<br>Working at height if equipment located on top of roofs or elevated electrical equipment (e.g., pylons) [or electrolyte tanks in the case of Flow BESS].<br>Consequences - Back and other injuries. | **The following is applicable to both Solid State Lithium Ion and Redox Flow BESS:**<br>• Training in lifting techniques.<br>• Training in working at heights.<br>• If equipment is at height (see OHS Act General Safety Regulation 6), ensure suitable safe (electrically and physically) ladders / harnesses etc. are available.<br>• Working at height procedure to be in place. |
| Human and Equipment Safety - exposure to fire radiation | Causes – Involvement in an external fire e.g., veld fire, maintenance vehicle fire, electrical systems fire.<br>Manufacturing defects or damage to battery leading to shorting and heating.<br>High humidity condensation of water or ingress of water or flooding leading to shorting.<br>Dust accumulation on electrical parts leading to overheating.<br>Excessive electrical loads - surges<br>Operator abuse<br>BMS failure or software failure.<br>Incorrect extinguishing medium, escalate the fire.<br>Consequences - Contaminated run off.<br>Radiation burns.<br>Damaged equipment.<br>Fire spreads to other units or offsite if grass/vegetation not controlled. | **The following is applicable to both Solid State Lithium Ion and Redox Flow BESS:**<br>• Grass cutting and fire breaks around the BESS installations to prevent veld fires.<br>• There are BESS design codes from the USA and standards of practice that can be used e.g., UL9540, NFPA 855 and DNV GL RP 43.<br>• Detailed Failure Modes and Effect Analysis (FMEA)/Hazop/Bowtie to be done during design at the component level and system levels.<br>• Safety integrity level rating of equipment (failure probably) with suitable redundancy if required. Site Acceptance Testing as part of commissioning of each unit and the overall system<br>• BMS should be checking individual cell voltage as well as stack, module, container, system voltages/current etc. BMS tripping the cell and possibly the stack/ building unit or module/rack/container, if variations in voltage. Diagnostics easily accessible. Diagnostics able to distinguish cell from stack or cell from module faults.<br><br>**The following is applicable to Solid State Lithium Ion BESS:**<br>• No combustible materials to be stored in or near the batteries or electrical infrastructure. Separation of site diesel tank, transformers from BESS and vice versa. Suggested minimum separation from substation is 20m.<br>• Abuse tests conducted by supplier.<br>• Protective systems are only as good as their reliability and functionality testing is important, e.g., testing that all battery trips actually work. Fire resistant barrier between the batteries and the PCS side if in the same container, or separate containers.<br>• Suitable ingress protection level provided for electrical equipment, e.g., IP55 - 66. If air cooling into container, suitable dust filters to be provided. Smoke detectors linked to BMS & alerts in control room.<br>• Effects of battery aging to be considered. Solid state battery life starts to be impacted above 40 deg C and significant impacts above 50 deg C with thermal run away starting at 65-70 deg C. BMS trips system at 50 deg C. Temperature monitoring to be in place. Regular infrared scanning. Data needs to be stored for trend analysis.<br>• Data indicates an event frequency of 0.001 per installation and with up to 700 units this would mean an event once 2 years, i.e. a high probability event. Most events will be small not resulting in injuries, but this is possible if the event is not controlled.<br>• Prior to commencement of cold commissioning, emergency plan from transport and construction phase to be extended to |

| Receptor | Description | Preventative and Mitigative Measures |
|---|---|---|
| | | operational phase and to include the hazards of the electrically live system. Procedure to address solid state container fires – extinguishing, ventilating, entering as appropriate or not. PPE for container firefighting include fire retardant, chemically resistant, nitrile gloves, antistatic acid resistant boots, fill face shields, BA sets.<br>• A planned fire response to prevent escalation to an explosion or an environmental event.<br>• Suitable supply of fire extinguishing medium and cooling medium<br>• Consider fire water for cooling adjacent equipment – BESS units.<br>• Can use fogging nozzles to direct smoke.<br>• Ensure procedures in place for clean up after event Lingering HF and other toxic residues in the soil and on adjacent structures.<br>• Procedures to be in place for Infra-red (IR) scanning (or other suitable method) to determine if batteries are still smouldering / are sufficient cooled to handle as batteries may still be active some weeks after an event.<br>• Smoke or gas detector systems that are not part of the original battery container package, need to be linked to the main control panel for the entire system so that issues can be detected and responded to rapidly.<br><br>**<u>The following is applicable to Redox Flow BESS:</u>**<br>• No combustible materials to be stored in or near the batteries or electrical infrastructure, e.g., separation of site diesel tank and separation from substations. In this case the risk is from the substation to the BESS and not vice versa. Apply normal electrical separation distances of substation to other independent infrastructure.<br>• Fire resistant barrier between the batteries and the PCS side if in the same container.<br>• Safety integrity level rating of equipment (failure probably) with suitable redundancy if required. Site Acceptance Testing as part of commissioning of each unit and the overall system.<br>• As per SANS Standards, suitable ingress protection (IP) level provided for electrical equipment, e.g., IP55 - 66. If air cooling into container / building, suitable dust filters to be provided if needed. Smoke detectors may be needed linked to BMS and alerts in the main control room.<br>• Effects of battery aging to be considered. Temperature monitoring, regular infrared scanning. Data stored for trend analysis.<br>• Protective systems functionality testing.<br>• Prior to commencement of cold commissioning, emergency plan from transport and construction phase to extended to operational phase and to include the hazards of the electrically live system. Procedure to address suitable extinguishing media, ventilating, entering container as appropriate or not. PPE for firefighting may need to include fire retardant, chemically resistant, nitrile gloves, antistatic acid resistant boots, fill face shields, BA sets. A planned fire response to prevent escalation to an environmental event is critical. Suitable fire extinguishing medium, cooling medium and adequate supply of both is critical e.g., cooling adjacent equipment and can use fogging nozzles to direct smoke. Ensure procedures in place to clean up after event Lingering toxic residues in the soil and on adjacent structures. |
| Human and Equipment Safety - exposure to fire radiation | Causes - Power Conversion System (PCS – DC to AC) cooling failure, electrical fire.<br>Consequences - Fire starts in PCS or another section or room and spreads to battery area. | **<u>The following is applicable to Solid State Lithium Ion BESS:</u>**<br>• Modern lithium container design places the PCS in another part of the container with a fire rated wall separating it from the battery. Alternately the PCS in another container altogether.<br><br>**<u>The following is applicable to Redox Flow BESS:</u>**<br>• VRFB building systems PCS in another area separating it from the batteries and other equipment |
| Human and Equipment Safety - exposure to explosion over pressures | **<u>The following is applicable to Solid State Lithium Ion BESS:</u>**<br>Cause 1 - Transformer shorting / overheating / explosion.<br>Cause 2 - Flammable gases generated by thermal run away reach explosive limits. Ignition on hot surfaces, static. Lithium Cobalt Oxide generates O2 during decomposition – escalation.<br>Consequences - Potential fatalities amongst first responders. Damage to container or other nearby items, e.g., other container.<br><br>**<u>The following is applicable to Redox Flow BESS:</u>**<br>Transformer shorting / overheating / explosion. | **<u>The following is applicable to Solid State Lithium Ion BESS:</u>**<br>• Electrical equipment will be specified to suit application.<br>• Emergency response plan and employee training referred to above is to be in place. This is only really likely to happen due to possible inappropriate emergency response, e.g., opening containers when they may be the type that should be left to burn out.<br>• Modern state of the art containers have ventilation systems for vapours.<br>• Undertake a hazardous area classification of the inside of the container to confirm the rating of electrical equipment, due to possible leaks of electrolyte or generation of flammable gases under thermal run away.<br>• Emergency response plan and employee training referred to above is critical.<br>• Suitable training of selected emergency responders who may be called out to the facilities is critical.<br>• NOTE. Refer to Appendix A of the Risk Assessment for an initial approximation of worst-case possible explosion impact zones.<br><br>**<u>The following is applicable to Redox Flow BESS:</u>**<br>• Electrical equipment will be specified to suit application. |

| Receptor | Description | Preventative and Mitigative Measures |
|---|---|---|
| | Consequences - Potential fatalities, e.g., amongst first responders. Damage to nearby equipment. | • Emergency response plan and employee training referred to above is to be in place. |
| Human and Equipment Safety - exposure to acute toxic chemical and biological agents | Causes Human pathogens and diseases, sewage, food waste.<br>Snakes, insects, wild and domesticated animals and harmful plants.<br>Consequences - Illness and at worst without mitigation, possibly extending to fatalities.<br>Effects can vary from discomfort to fatalities for venomous snakes or bee swarms etc | **The following is applicable to both Solid State Lithium Ion and Redox Flow BESS:**<br>• All necessary good hygiene practices to be in place, e.g., provision of sanitation facilities, eating areas, infectious disease controls.<br>• Policies and practice for dealing with known vectors of disease such as AIDS, TB, COVID 19 and others.<br>• Awareness training for persons on site, safety induction to include animal hazards.<br>• First aid and emergency response to consider the necessary anti-venom, anti-histamines, topical medicines etc.<br>• Due to isolated locations some distance from town, the ability to treat with anti-venom and extreme allergic reactions on site is critical to mitigate the impacts |
| Human and Equipment Safety - exposure to acute toxic chemical and biological agents | Causes - Damaged batteries components, leak electrolyte, are completely broken exposing hazardous chemicals.<br>Hazardous fumes released on thermal run away see fire above.<br><br>Consequences - Impacts can vary from mild skin irritation from exposure to small leaks to serious corrosive burns for large exposure.<br><br>In the case of toxic fumes, serious lung damage (Solid State BESS only). | **The following is applicable to both Solid State Lithium Ion and Redox Flow BESS:**<br>• PPE to be increased (e.g., full-face shield, aprons, chemical suits) for operations that involve opening equipment and potential exposure, e.g., sampling, maintenance.<br>• All operators/maintenance staff trained in the hazards of chemicals on site.<br>• 24/7 helpline response.<br>• Standard dangerous goods requirements for Hazmat labels.<br>• All operators/maintenance staff trained in the hazards.<br><br>**The following is applicable to Solid State Lithium Ion BESS:**<br>• Acid resistant PPE (e.g., overalls, gloves, eyeglasses) to be specified for all operations in electrolyte areas.<br>• Batteries contained, modules contained and all inside a container that acts as bund.<br>• Refer to fire above as all the protective measures apply to prevent toxic smoke.<br>• Refer to fire above as all the measures apply to mitigate toxic smoke.<br>• NOTE Refer to Appendix A of the Risk Assessment for an initial approximation of worst case possible noxious smoke impact zones.<br><br>**The following is applicable to Redox Flow BESS:**<br>• Corrosion resistant PPE (e.g., overalls, gloves, eyeglasses) to be specified for all operations in electrolyte areas.<br>• Electrolyte contained, modules contained inside a building that is bunded. |
| Human and Equipment Safety - exposure to violent release of kinetic or potential energy | Causes - Moving equipment, pumps, heavy equipment at elevation, nip points, working at heights.<br>Traffic accidents. Earthquake / tremor.<br>Consequences - Injury. Fatality in unlikely worst case, e.g., traffic accidents or fall from heights.<br>Damage to equipment, spills, environment pollution | **The following is applicable to both Solid State Lithium Ion and Redox Flow BESS:**<br>• Apart from pumps, no major moving parts during operation.<br>• Maintenance equipment to be serviced and personnel suitably trained in the use thereof.<br>• Normally just small vehicles on site, bakkies, grass cutting, cherry-pickers etc. Possibly large cranes if large equipment or elevated structure removed/replaced.<br>• Traffic signs, rules etc in place on site.<br>• All normal working at heights, hot work permits, confined space entry, cordon off unsafe areas/works etc to be in place.<br>• Emergency response plan.<br>• Civil design to take seismic activity into account. |
| Human and Equipment Safety - exposure to electromagnetic waves | Causes - Use of electrical machines, generators etc.<br>Hot dry area static generation is highly likely.<br>Lightning strike.<br>Consequences - Electrocution.<br>Ignition and burns. Injury and death.<br>Damage electrical equipment. | **The following is applicable to both Solid State Lithium Ion and Redox Flow BESS:**<br>• Codes and guidelines for electrical insulation.<br>• Suitable PPE to be specified.<br>• Ensure trained personnel and refer to guideline – IEE 1657 – 2018.<br>• Ensure compliance with Eskom Operating Regulations for high voltage systems including access control, permit to work, safe work procedures, live work, abnormal and emergency situations, keeping records.<br>• Electromagnetic fields, impact on other equipment e.g., testing devices, mobile phones – malfunction, permanent damage.<br>• Software also need to be kept as update to date as reasonably practicable.<br>• Consider suitably located Emergency stop buttons for the facility and the other equipment on site.<br>• PPE to consider static accumulation for entering the facility, and particularly the battery containers especially after a high temperature shut down where there could possibly be flammable materials.<br>• The procedures for responding to alarm and auto shut down on containers, needs to consider that there may be a dangerous environment inside and how to protect personnel who may enter to respond.<br>• All outside work must be stopped during thunder storms. |

| Receptor | Description | Preventative and Mitigative Measures |
|---|---|---|
| | | • Lightning conductors may be required for the installation, to be confirmed during design<br><br>**<u>The following is applicable to Solid State Lithium Ion BESS:</u>**<br>• Risk to and from electricity transmission pylons, suggest separation at least the pylon fall height, e.g. >10m for 10m tall pylons.<br><br>**<u>The following is applicable to Redox Flow BESS:</u>**<br>• Low voltage equipment (e.g., batteries) separated from high voltage (e.g., transmission to grid). Risk of pylons to BESS, suggest at least the pylon fall height, e.g. >10m for 10m tall pylons. |
| Environment - emissions to air | Not expected on a normal basis.<br>Refrigerant may be an asphyxiant if accidentally released indoors it can accumulate and displace oxygen. | **<u>The following is applicable to both Solid State Lithium Ion and Redox Flow BESS:</u>**<br><br>Especially after any warning alarms have gone off, but possibly even normally the container could be treated as entering a confined space and similar procedures could be in place, e.g., do not enter alone, gas testing prior to entering, ensure adequate ventilation. |
| Environment - emissions to water | Causes - Cooling water blow-down.<br>Laboratory waste (if included in the design).<br>Maintenance waste, e.g., oils.<br>Spills from batteries, coolant system, diesel trucks, transformers.<br>Parked vehicles – oil drips.<br>Fire water runoff control.<br>Kitchen waste and sewage.<br>Refrigerant release.<br>VRFB electrolyte purging (Redox Flow BESS only).<br><br>Consequences - Pollution if not contained.<br>Excessive disposal costs if emissions not limited. | **<u>The following is applicable to both Solid State Lithium Ion and Redox Flow BESS:</u>**<br>• Bunding under any outdoors tanks, curbing under truck offloading areas and sealed surfaces (e.g., concrete) under truck parking area is particularly important.<br>• Sewage and any kitchen liquids - containment and suitable treatment/disposal.<br>• Procedures for dealing with damaged/leaking equipment as well as clean-up of spills.<br>• Normal site practices for preventing and containing diesel/paint etc spills.<br>• Waste management plan to be in place e.g., liquid waste treatment or suitable removal and disposal will be provided.<br>• Spill clean-up procedures to be in place before bringing container on site, including spill kits – non-combustible materials, hazmat disposal.<br>• The National Environment Management Act (NEMA) Section 30, the DEA Guidelines have a list of hazard categories with Reportable spill Quantities, ensure compliance with this by listing all materials on site, their hazard categories and determining the spill thresholds for reporting.<br><br>• **<u>The following is applicable to Redox Flow BESS:</u>**<br>• Electrolyte areas fully bunded to 110% of largest tank, or more.<br>• The National Environment Management Act (NEMA) Section 30, the DEA Guidelines have a list of hazard categories with Reportable spill Quantities, ensure compliance with this by listing all materials on site, their hazard categories and determining the spill thresholds for reporting. This is particularly relevant for liquid filled systems such as RFB.<br>• Process controls in place to prevent contamination and deterioration of electrolyte leading to excessive purging.<br>• Ensure proposed locations of the BESS facilities are a suitable distance from the closest water course. Relevant recommendations have been made by the Aquatic Specialist and Groundwater Specialists, and this has been factored into the layout. Refer to the relevant studies for additional information. In the event of a major spill if this is too close it may not allow time for mitigation to be taken. Adequate secondary and possibly tertiary containment systems may then be needed on site. |
| Environment - emissions to earth | Causes - Mess area and other solid waste. Disposal of solid-state batteries (for Solid State BESS). Disposal of battery components (Redox Flow BESS).<br><br>Consequences - Environmental damage. | **<u>The following is applicable to both Solid State Lithium Ion and Redox Flow BESS:</u>**<br>• Implement waste segregation (e.g., electronic equipment, chemicals, domestic) and management on the site.<br><br>**<u>The following is applicable to Redox Flow BESS:</u>**<br>• During commissioning there will be a need for bulk transport of electrolyte to site and transfer of electrolyte into the tanks within the containers. Suitable secondary containment of possible spills / overfills etc. during this transfer process will need to be in place. |
| Environment - waste of resources e.g., water, power etc | Causes - Similar to construction phase.<br>Disposal of batteries or components.<br>Disposal of containers.<br>Water usage not controlled.<br>Excessive purging of deteriorated or contaminated electrolyte (Redox flow only).<br><br>Consequences - Delays. Excessive costs and disposal of large volumes of hazardous waste. | **<u>The following is applicable to both Solid State Lithium Ion and Redox Flow BESS:</u>**<br>• Water usage to be monitored on site.<br>• Water management plan and spill containment plans to be in place.<br><br>**<u>The following is applicable to Solid State Lithium Ion BESS:</u>**<br>• Handling protocols to be provided by supplier of batteries.<br>• Investigate end of Life plan for solid state batteries - reuse / recovery / reconditioning.<br>• Similarly, for decommissioned containers – reuse / recovery / repurpose.<br><br>**<u>The following is applicable to Redox Flow BESS:</u>** |

| Receptor | Description | Preventative and Mitigative Measures |
|---|---|---|
| | | • Handling protocols to be provided by supplier of electrolyte.<br>• Investigate End of Life plan for electrolyte - reuse / recovery / reconditioning.<br>• Similarly, for decommissioned containers / equipment – reuse / recovery / repurpose |
| Public - Aesthetics | Causes - Bright surfaces reflecting light.<br>Tall structures in a flat area.<br>Consequences - Irritation. | **The following is applicable to both Solid State Lithium Ion and Redox Flow BESS:**<br>• Refer to the Visual Impact Assessment undertaken as part of the BA. |
| Investors - Financial | Causes - Defective technology.<br>Extreme project delays.<br>Consequences - Financial loss | **The following is applicable to both Solid State Lithium Ion and Redox Flow BESS:**<br>• Operation by experienced personnel using internationally recognized and proven technology operating procedures.<br>• Operations management with deviation monitoring. |
| Employees and investors - Security | Causes - On route, potential hi-jacking of valuable but hazardous load.<br>On site, theft of construction equipment and battery installation facilities.<br>Civil unrest or violent strike by employees.<br>Consequences - Theft.<br>Injury to burglars.<br>Damage to equipment possibly setting off thermal runaway. | **The following is applicable to both Solid State Lithium Ion and Redox Flow BESS:**<br>• Fencing around electrical infrastructure to SANS standard and Eskom Guidelines.<br>• Consider motion detection lights and CCTV.<br>• The hazardous nature of the electrical and battery equipment should be clearly indicated – e.g., Skull and Cross Bones or other signs.<br>• Isolated location both helps and hinders security.<br>• Night lighting to be provided both indoors and outdoors where necessary. |
| Employees and investors - Security | Causes - Cyber security attacks aimed at the National Electricity Grid.<br>Consequences - Ransom of the National Electricity Grid. | **The following is applicable to both Solid State Lithium Ion and Redox Flow BESS:**<br>• Cyber security needs monitoring. Remote access to system needs to be negotiated and controlled e.g. Password controls, levels of authority etc. to ensure protection of the National Electricity Grid from Cyber-attacks accessing through the BESS.<br>• Cyber emergency procedures – should be in place prior to commissioning. |
| Emergencies | Causes - Fires, explosions, toxic smoke, large spills, traffic accidents, equipment/structural collapse.<br><br>Inadequate emergency response to small event leads to escalation.<br>Consequences - Injuries turn to fatalities, small losses become extended down time. | **The following is applicable to both Solid State Lithium Ion and Redox Flow BESS:**<br>• All safety measures listed above.<br>• Emergency procedures need to be practiced prior to commencement of operations.<br>• More than one exit from buildings.<br><br>**The following is applicable to Solid State Lithium Ion BESS:**<br>• Escape doors should swing open outwards and not into the container. Doors should be able to be hooked open when persons are inside the container, i.e. they should not be automatically self-closing.<br>• Storage of spare batteries (e.g., in stores on site or elsewhere) also needs to consider possible thermal run away.<br>**The following is applicable to Redox Flow BESS:**<br>• Escape doors should swing open outwards and not into the building/container. |
| Investors - Legal | Causes Battery field is evolving quickly with new guides, codes and regulations happening at the same time as evolving technology.<br>Consequences - Unknown hazards manifest due to using “cheaper supplier or less developed technology”. | **The following is applicable to both Solid State Lithium Ion and Redox Flow BESS:**<br>• Use only internationally reputable battery suppliers who comply with all known regulations/guideline at the time of purchasing.<br>• Where reasonably practicable ensure only “state of the art” battery systems are used and not old technologies prone to fires/explosions etc. |

**DECOMMISSIONING PHASE - VANADIUM REDOX FLOW BATTERY ENERGY STORAGE SYSTEMS and SOLID STATE LITHIUM-ION BATTERY ENERGY STORAGE SYSTEMS**

Battery components may have a limited lifespan, there are damaged equipment, waste electrolyte etc. There could already be “waste” on the first day of commissioning and plans should be in place to deal with this. Ideally an End-of-Life plan needs to be in place before the first electrolyte / BESS container / equipment is brought on site. All decommissioning activities must comply with the relevant regulations at the time. Most preventative and mitigation measures are as per the construction and operational phases listed above, and should be considered where relevant (and have not been repeated below).

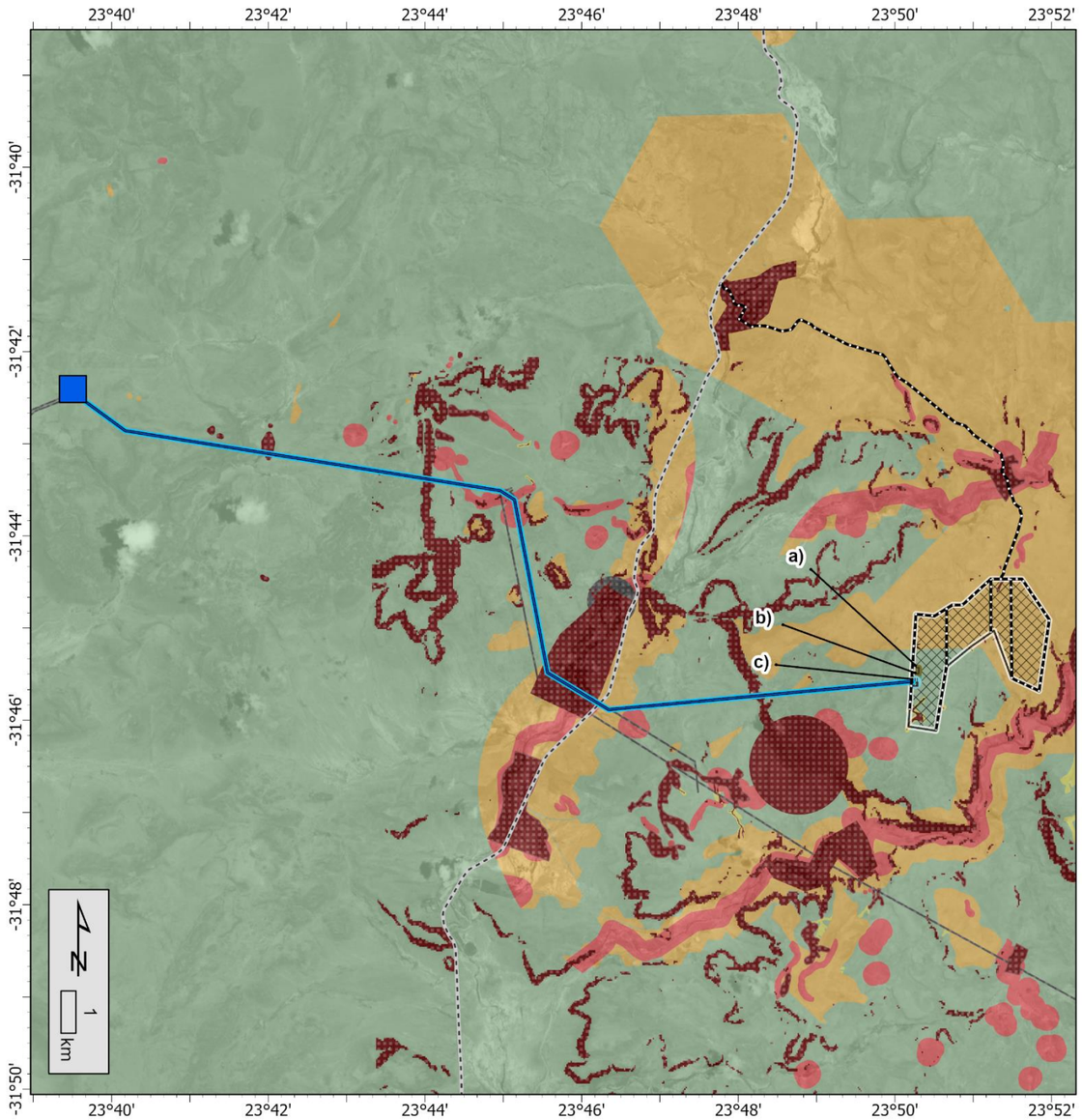
| Receptor | Description | Preventative and Mitigative Measures |
|---|---|---|
| Environment - emissions to earth | Causes - Batteries / equipment reached end of life and may leak.<br>Consequences - Environment damage from heavy metal ions. | • End of Life shutdown procedure including a Risk Assessment of the specific activities involved.<br>• Where possible re-purpose the batteries / containers and equipment with associated environmental impact considered.<br>• Disposal according to local regulations and other directives such as the European Batteries Directive, where relevant.<br>• End of life, which is affected by temperature and time, cycles etc, should be predefined and the monitoring should be in place to |

| Receptor | Description | Preventative and Mitigative Measures |
|---|---|---|
| | | determine if it has been reached. |
| Investors - Legal | Disposal of hazardous “waste” is rife with difficulties and numerous regulations that need to be complied with. | • Applicants should seek the opinion from a waste consultant on how to correctly dispose of hazardous waste. |

## APPENDIX E: SENSITIVITY MAP FOR THE STUDY AREA

# Proposed Padloper Solar Photovoltaic (PV) and Electricity Grid Infrastructure (EGI) cluster

### near Murraysburg, in the Western Cape and Northern Cape, South Africa




Padloper PV 1 site (assessment area)
Solar array
a) Temporary facilities and laydown
b) On-site substation and O&M building *
c) On-site switching station
Overhead power line (Padloper EGI 1)
Access and internal roads
Ishwati Emonyeni Substation (DFFE ref: 12/12/20/2351)

**Combined sensitivity**

No-go
No-go (BESS only) *
Very high
High
Moderate
Moderate-Low
Low

* BESS located within the "On-site substation and O&M building" area must be placed at least 20 m away from other infrastructure.

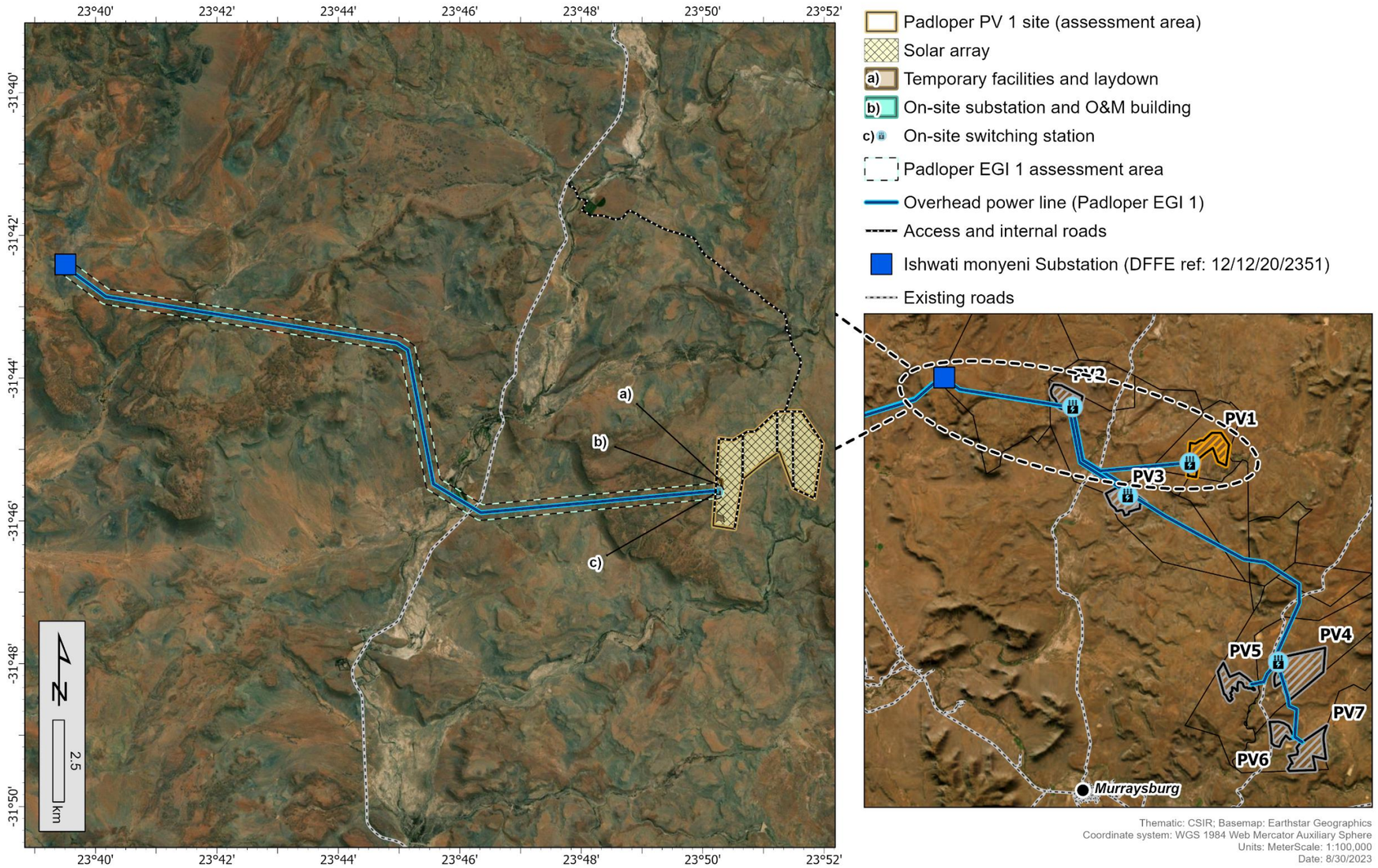
Thematic: CSIR; Basemap: Earthstar Geographics
Coordinate system: WGS 1984 Web Mercator Auxiliary Sphere
Units: MeterScale: 1:100,000
Date: 9/2/2023

**APPENDIX E-1. Combined sensitivity map for the proposed Padloper Solar PV Facility 1 as assessed during the BA Phase.**

# APPENDIX F: LAYOUT MAP

## Proposed Padloper Solar Photovoltaic (PV) and Electricity Grid Infrastructure (EGI) cluster

### near Murraysburg, in the Western Cape and Northern Cape, South Africa

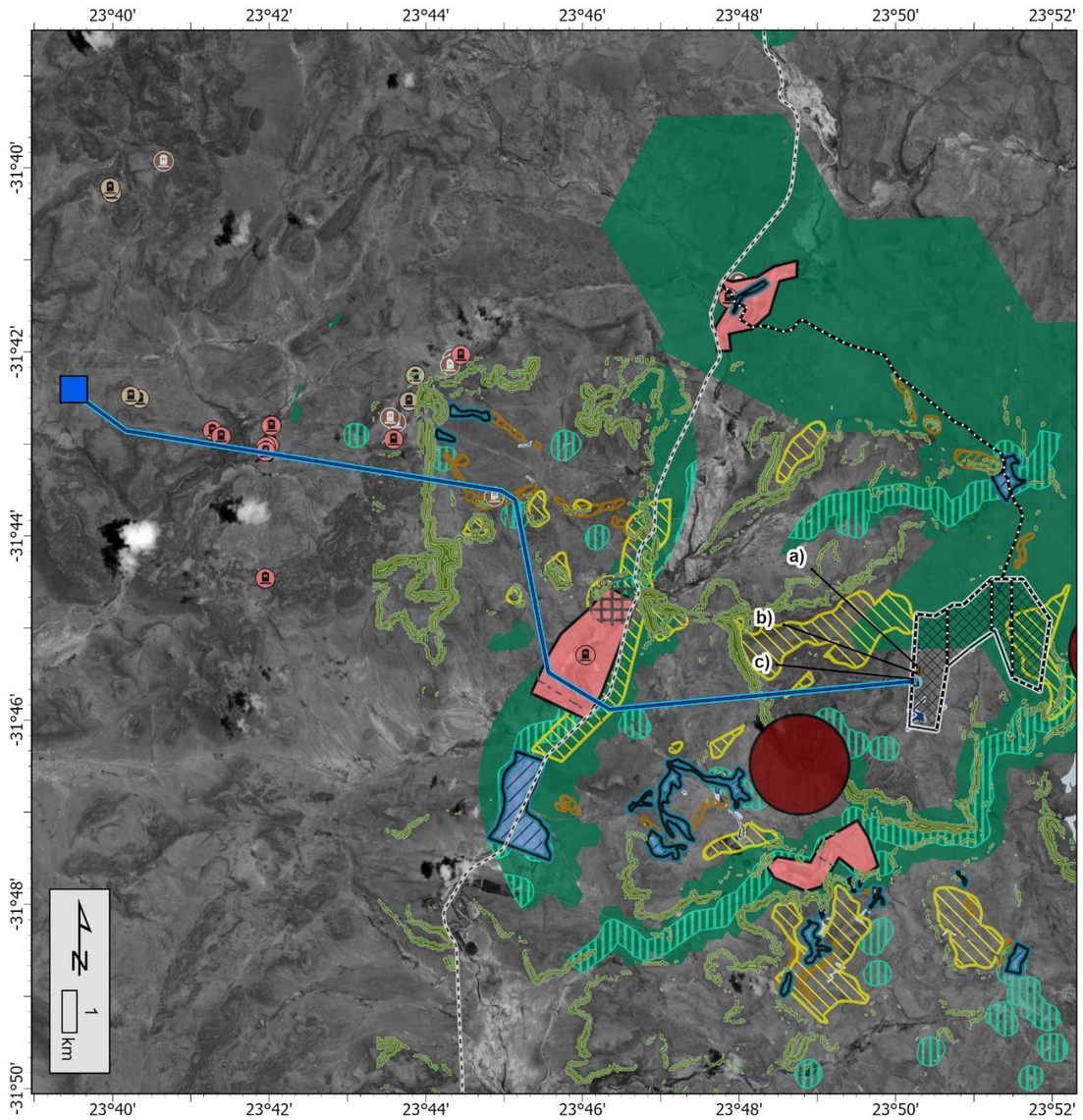



**APPENDIX F-1. Site layout map showing the project infrastructure placement of the proposed Padloper Solar PV Facility 1 as assessed during the BA Phase.**

# APPENDIX G: ENVIRONMENTAL FEATURES MAP

## Proposed Padloper Solar Photovoltaic (PV) and Electricity Grid Infrastructure (EGI) cluster

### near Murraysburg, in the Western Cape and Northern Cape, South Africa




Padloper PV 1 site (assessment area)
Solar array
a) Temporary facilities and laydown
b) On-site substation and O&M building
c) On-site switching station
Overhead power line (Padloper EGI 1)
Access and internal roads
Ishwati Emonyeni Substation (DFFE ref: 12/12/20/2351)

**Environmental features (per sensitivity class)**

**No-go**
- Verreaux's Eagle nest (1km buffer)
- Slopes > 12 degrees
- Core functional habitat - alluvial washes and watercourses with riparian zone
- Core functional habitat- watercourses / drainage lines
- Recorded heritage features
- BESS risk - Homesteads, major roads and other infrastrucuture buffer

**Very high**
- Alluvial washes and watercourses buffer

**High**
- Ridges and outcrops (with buffers)
- Wetlands
- Recorded heritage features

**Moderate**
- Critical Biodiversity Areas (CBA 1 & 2)
- Recorded heritage features
- Visual

**Moderate-low**
- Drainage lines (with buffers)

**Low**
- Recorded heritage features

Thematic: CSIR; Basemap: Earthstar Geographics
Coordinate system: WGS 1984 Web Mercator Auxiliary Sphere
Units: MeterScale: 1:100,000
Date: 9/2/2023

**APPENDIX G-1. Environmental features map for the proposed Padloper Solar PV Facility 1 as assessed during the BA Phase.**