

Vlakfontein Solar PV1

Remainder of Vlakfontein No 15
Portion 1 of Jackalsfontein No 443

DRAFT Environmental Management Programme

March 2023

Applicant

Vlakfontein Solar PV1 (Pty) Ltd

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Project Detail

Project Name	Vlakfontein Solar PV1
DFFE Reference Number	To be provided
EMPr Status	Draft Environmental Management Programme
Date of EMPr	March 2023

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LIST OF ABBRVEIATIONS

BAR	Basic Assessment Report
BID	Background Information Document
CBA	Critical Biodiversity Area
CEMP	Construction Environmental Management Programme
dBAR	Draft Basic Assessment Report
DEFF	National Department of Environment, Forestry & Fisheries
DSR	Draft Scoping Report
DWS	Department of Water & Sanitation
DMR	Department of Mineral Resources
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
EMF	Environmental Management Framework
EMPr	Environmental Management Programme
ESA	Ecological Support Area
EWT	Endangered Wildlife Trust
fBAR	Final Basic Assessment Report
GA	General Authorisation
GNR	Government Notice Regulation
ha	Hectare(s)
HIA	Heritage Impact Assessment
IAPs	Interested and Affected Parties
IEM	Integrated Environmental Management
m3	Cubic metres
Mamsl	Metres above mean sea level
n/a	Not applicable
NEMA	National Environmental Management Act, 1998 (Act No 107 of 1998)
NEMPAA	National Environmental Management: Protected Areas Act, 2003 (Act No 57 of 2003)
NEMWA	National Environmental Management: Waste Act, 2008 (Act No 59 of 2008)
PIA	Palaeontological Impact Assessment
PPP	Public Participation Process/Programme
SAHRA	South African Heritage Resources Agency
SANBI	South African National Biodiversity Institute
SR	Scoping Report
PHRA	Provincial Heritage Resources Authority
PoS	Plan of Study
SIP	Strategic Infrastructure Project
TRF	Transnet Freight Rail
TS	Traction Station / Traction Substation
WUA	Water Use Authorisation
WULA	Water Use License Application

ELECTRICAL AND RENEWABLE TERMS AND ABBREVIATIONS

CSP	Concentrated Solar Power
BFD	Bird Flight Diverters
EGI	Electrical Grid Infrastructure
EMI	Electro-Magnetic Interference
Eskom SOC	South Africa's Electricity Supply Commission (State Owned Company)
ICNIRP	International Commission for Non-Ionising Radiation Protection
IEP	Integrated Energy Plan
IPP	Independent Power Producer
IRP	Integrated Resource Plan
ISEP	Integrated Strategic Electricity Planning
LiLo	Loop-in Loop-out (Powerlines)
MTS	Main Transmission Substation
NDP	Network Development Plan
NERSA	National Energy Regulator of South Africa
PV	Photovoltaic (solar panels)
REDZ	Renewable Energy Development Zone
REIPPP	Renewable Independent Power Producer Programme
RFI	Radio Frequency Interference
SS	Substation
STC	Strategic Transmission Corridor

Voltage

kV	Kilovolt (1kV = 1 000V)
MVA	Mega Volt Ampère

Units of power

kW	Kilowatt (1kW= 1 000W)
MW	Megawatt (1MW=1 000kW)

CHAPTER 1: OVERVIEW

1.1 Objectives of the EMPr

The Environmental Management Programme (EMPr) has the following objectives:

- To state the standards and guidelines which the EA Holder will be required to adhere to in terms of environmental legislation;
- To set out the mitigation measures and environmental specifications which the EA Holder will be required to implement for the design, construction and operational phases of the project in order to minimise the extent of environmental impacts, and where possible to improve the condition of the environment;
- To provide guidance regarding the method statements which will be required to compile and implement to achieve environmental specifications;
- To define corrective actions which must be taken in the event of non-compliance with the specifications of this EMPr;
- To mitigate potential negative impact and ensure optimisation of positive impact;
- To prevent long-term or permanent environmental degradation;
- To ensure that the applicant, construction workers and the operational and maintenance staff are well acquainted with their responsibilities in terms of the environment;
- To ensure that communication channels to report on environment related issues are in place.

1.2 Details of EA Holder Responsible for Implementation of the EMPr

The application for Environmental Authorisation (EA) was made in the name of **Vlakfontein Solar PV1 (Pty) Ltd**. The contact details of the key representative are as follows:

Top Floor, Golf Park, 4 Raapenberg Rd, Mowbray, 7700
PostNet Suite #53 Private Bag X21 Howard Place, 7450
Care of:
Mulilo Renewable Energy Projects
The Director of Solar, Ms Warren Morse
warren@mulilo.com
Tel 021 685 3240 / 083 760 9586

1.3 Agreement and Undertaking of the EA Holder

By submitting this signed document to the Department of Forestry, Fisheries and the Environment (DFFE) prior to construction as per legal requirement, the EA Holder confirms his/her/their knowledge and awareness of the content of this EMPr, as well as the responsibility to comply with relevant legislation pertaining to the nature of the work to be done.

Signed on behalf of: _____

Date: _____

Place: _____

Signature: _____

Full Name: _____

Physical Address: _____

Postal Address: _____

Office Telephone Number: _____

Email address: _____

1.4 Details and Expertise of the Environmental Assessment Practitioners

Landscape Dynamics Environmental Consultants (Pty) Ltd is the environmental consultants appointed for this project. Landscape Dynamics is an environmental consultancy firm established in May 1997. The main line of business since that time up to the present is the compilation of Environmental Impact Assessments. Landscape Dynamics has a broad client base from both the private and government sectors which has developed over the past 24 years of professional services supplied.

The operating base for Landscape Dynamics is the entire South Africa; with local representation in Gauteng, the North West Province, Mpumalanga, Western Cape, Northern Cape and Limpopo.

The Environmental Assessment Practitioners (EAPs) for this project are Ms Annelize Erasmus and Ms Susanna Nel. Both EAPs are registered with EAPASA. The Landscape Dynamics Company Profile with the relevant condensed Curriculum Vitae is attached under Appendix B.

1.5 Project Team

The impact that this project might have on the environment can only be effectively assessed if all the environmental project components are satisfactorily identified and considered. A multi-disciplinary approach was therefore required and the following team provided input this EMPr.

Environmental Assessment Practitioners

Company name	Contact person(s)	Responsibility
Landscape Dynamics Environmental Consultants	Ms Annelize Erasmus Ms Susanna Nel	<ul style="list-style-type: none"> ○ EIA Project Management ○ Environmental Assessment Practitioners ○ Public Participation Programme

Environmental Specialist Team

Company name	Contact person(s)	Specialist field of study
Enviroguard Ecological Services CC	Prof Leslie Brown Clayton Cook	Fauna & Flora Impact Assessment
BlueScience (Pty) Ltd	Ms Toni Belcher	Aquatic Impact Assessment
CTS Heritage	Ms Jenna Lavin	Heritage & Palaeontology Impact Assessment
Chris van Rooyen Consulting and Afrimage Photography	Mr Chris van Rooyen Mr Albert Froneman	Avifauna Impact Assessment
Inkululeko Wildlife Services (Pty) Ltd	Dr Caroline Lötter	Bat Screening Assessment
VRM Afrika	Mr Steve Stead	Visual Impact Assessment
Tony Barbour Environmental Consulting and Research	Mr Tony Barbour	Socio-economic Impact Assessment
Johann Lanz Soil Scientist	Mr Johann Lanz	Agricultural Impact Assessment

Project Team

Company Name	Contact person	Engineering field of study
Interference Testing And Consultancy Services (Pty) Ltd	Mr Callie Fouché	RFI Impact Assessment
ISHECON	Ms Debbie Mitchel	High Level Risk Assessment
JG Afrika	Ms Iris Wink	Traffic and Transportation ¹
INDEX Social Consulting Services	Ms Marchelle Terblanche	Application for Change in Land Use
Afrimage Photography	Mr Albert Froneman	Mapping and GIS support

Applicant

The EIA Project Team is supported by the following team members from within Mulilo Renewable Project Developments (Pty) Ltd, on behalf of the applicant Vlaktefontein Solar PV1 (Pty) Ltd:

Contact Person	Responsibility
Mr Warren Morse	Director: Solar & Energy Storage
Mr Andrew Pearson	Environmental Manager
Mr Ryan David Anderson	Permitting and Environmental Manager
Mr Lloyd Barnes	Junior Project Manager: Permitting and Environmental
Mr Johan Janse van Rensburg	Project Engineer
Mr Gerhard Mc Namara	Project Engineer
Mr Constantin Hatzilambros	Project Manager

CHAPTER 2: BACKGROUND, LOCALITY AND PROJECT DESCRIPTION

2.1 Background

2.1.1 The Mercury Solar PV Cluster

The Mercury Solar PV Cluster involves the following 5 PV farms:

Name of PV facility	MW (540MW total)	Areas investigated for development	Project footprint area	Farm Name
Ratpan Solar PV1	Up to 120MW	293ha	193 ha	Remainder of Ratpan No 441
Hormah Solar PV1	Up to 120MW	227ha	198 ha	Portion 2 of Hormah No 276
Zaaiplaats Solar PV1	Up to 120MW	356ha	281 ha	Remainder of Zaaiplaats No 190 Remainder of Fraai Uitzicht No 189 Portion 2 of Fraai Uitzicht No 189
Kleinfontein Solar PV1	Up to 120MW	354ha	290 ha	Portion 1 of the Farm Kleinfontein No 369
Vlakfontein Solar PV1	Up to 100MW	493ha	151 ha	Portion 1 of Jackalsfontein No 443 Remainder of Vlakfontein Nr 15

Table 1 Summary Table of the Mercury Solar PV Cluster

Each Photovoltaic (PV) solar facility will be treated as a standalone application and five separate applications for Environmental Authorisations will therefore be made. The electrical grid infrastructure (connecting the facilities to the existing Mercury Substation or existing Eskom powerlines) for these five facilities will be dealt with in terms of Gazette Notice Nr 2313, 27 July 2022: Standard for the Development and Expansion of Power Lines and Substations within identified Geographical Areas.

The Vlakfontein Solar PV1 facility is the subject of this EMPr

Refer to the Mercury Solar PV Cluster map.

Mercury Solar PV Cluster: Properties Map
Adjacent and Surrounding Properties

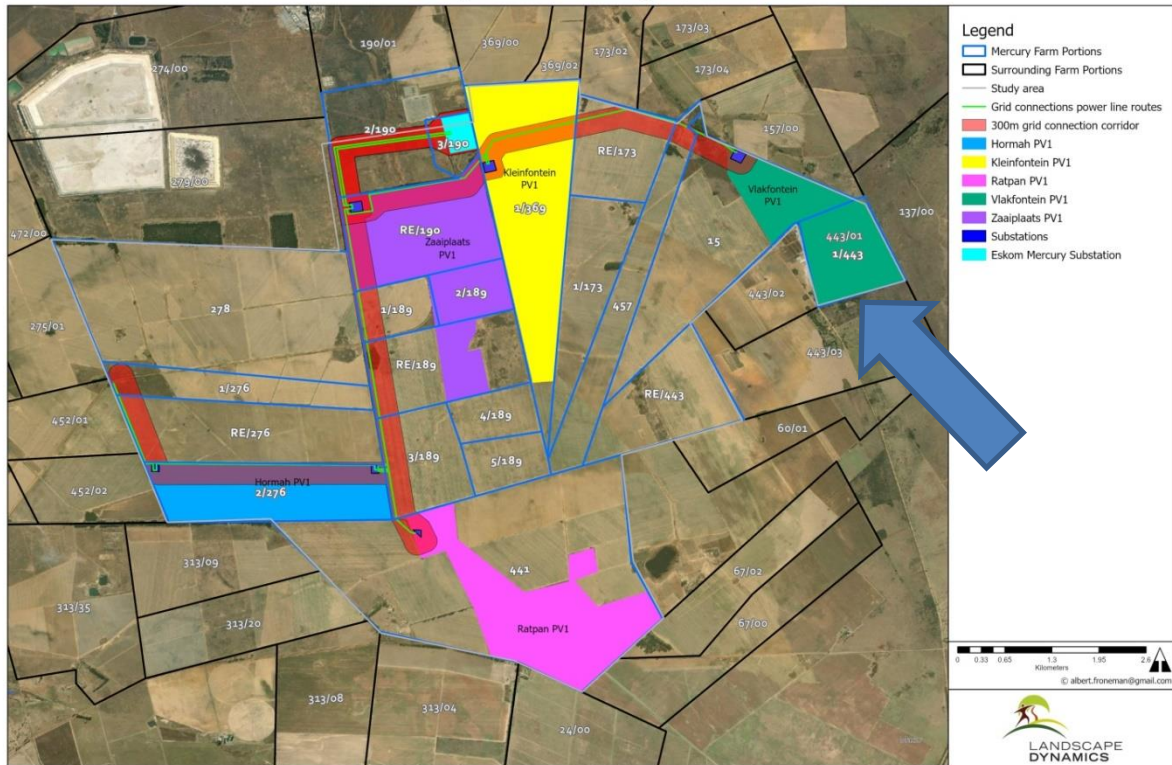


Figure 1: The Mercury Solar PV Cluster

2.1.2 Renewable Energy Development Zone

Government Gazette 41445, Notice Number 114 of 16 February 2018 identifies Renewable Energy Development Zones (REDZs) in which the construction of solar PV facilities can be expected. The Mercury Solar PV Cluster project falls entirely within the Klerksdorp REDZ.

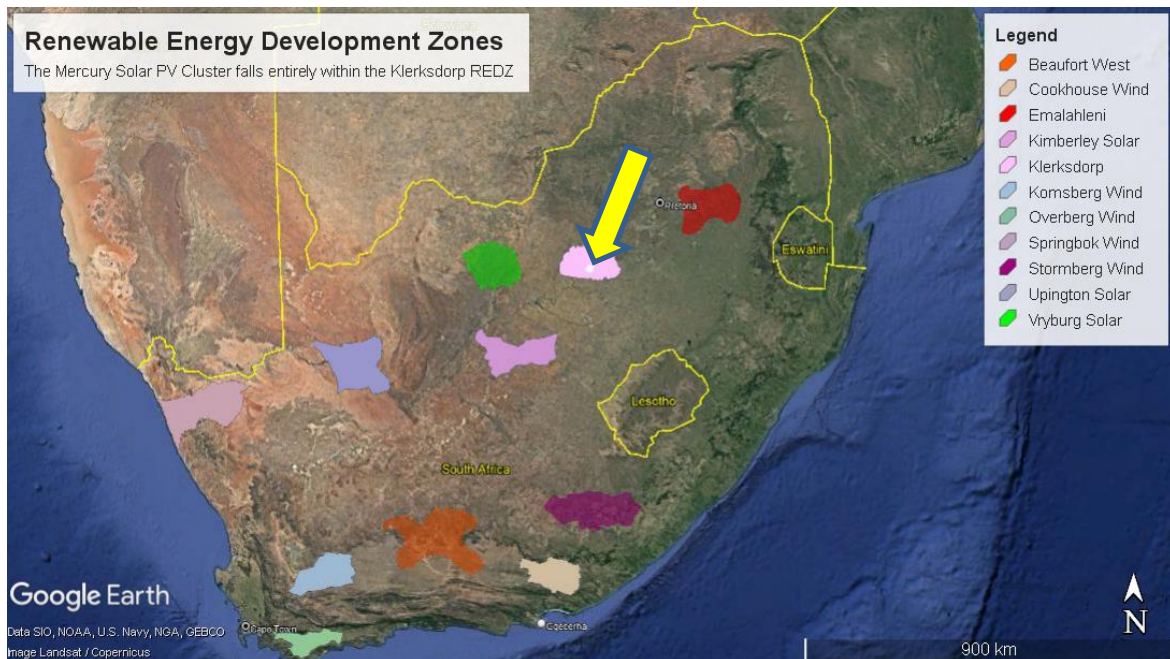


Figure 2: Renewable Energy Development Zones

Gazette Notice Nr 2313, 27 July 2022: Standard for the Development and Expansion of Power Lines and Substations within identified Geographical Areas is also applicable to electrical infrastructure that falls within the STCs. In the case of the Vlakfontein Solar PV1 facility, the onsite 132kV switching station and a 132kV power line which will be handed over to Eskom after construction will be dealt with according to the above-mentioned stipulations in a separate application. The substation however forms part of the project components of the Vlakfontein Solar PV1 facility and has been dealt with under the relevant application for Environmental Authorisation.

2.1.3 Competent Authority

It is the intention of the EA Holder to bid the Vlakfontein Solar PV1 facility in future bidding rounds of the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP). The fact that the EA Holder intent to bid is in support of the IRP and the **Department of Forestry, Fisheries & the Environment (DFFE)** is therefore the Competent Authority for this project.

2.2 Locality

The development site is situated north of the R76 close to the town of Viljoenskroon in the Free State Province. It falls within the jurisdiction of the Mophaka Local Municipality (MLM) in the Fezile Dabi District Municipality.

Mercury Solar PV Cluster: Locality Map

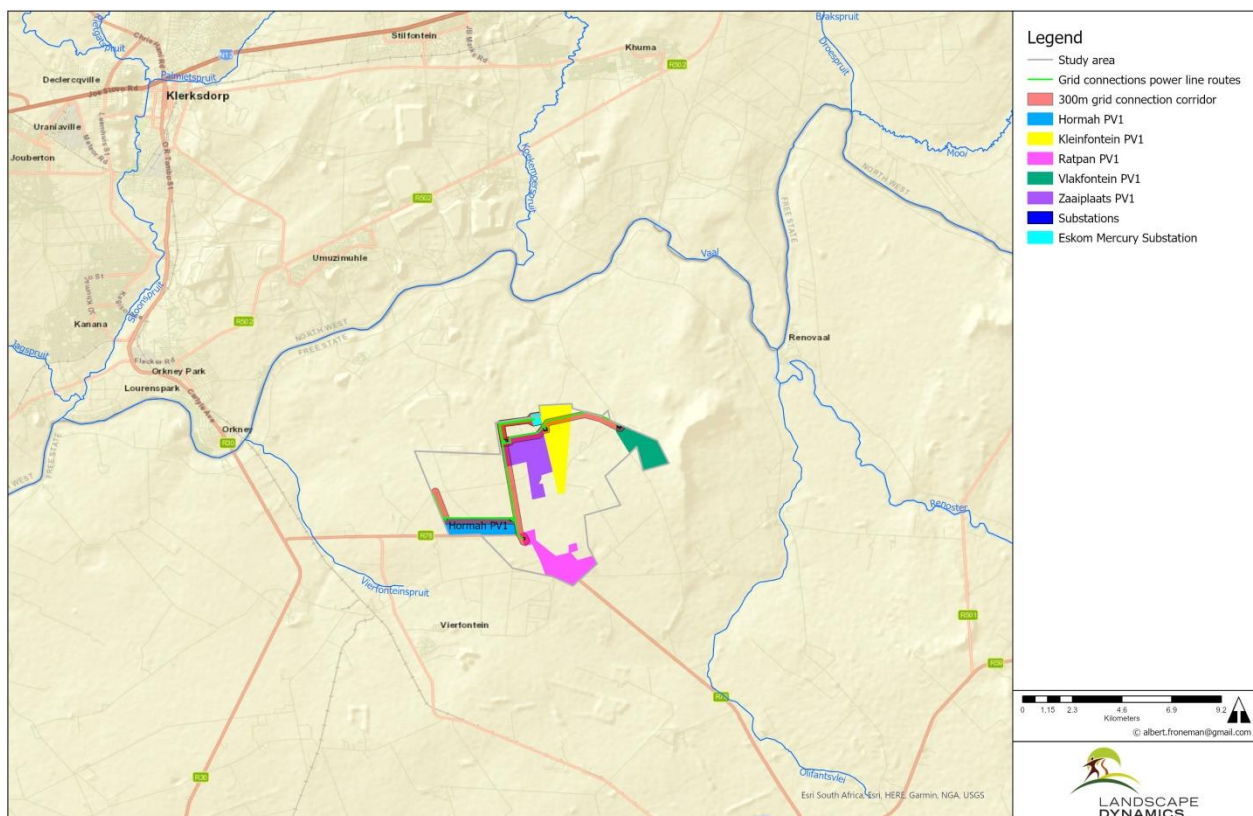


Figure 3: Locality Map

2.3 Project Description

The **Vlakfontein Solar PV1** facility will have a contracted capacity of up to 100MW on land of approximately 151ha in size.

Mulilo Renewable Project Developments (Pty) Ltd ('the Developer') is proposing the development of a Photovoltaic (PV) Solar Energy Facility and associated infrastructure on Portion 1 of Jackalsfontein No 443 and the Remainder of Vlakfontein Nr 15, located in the Moqhaka Local Municipality in the Free State Province. The applicant for Environmental Authorisation (EA) will be Vlakfontein Solar PV1 (Pty) Ltd., a special purpose vehicle (SPV) fully owned by the Developer. The project is planned as part of a cluster of renewable energy facilities known as the Mercury Solar PV Cluster, which includes four (4) additional solar PV facilities (Hormah Solar PV1, Kleinfontein Solar PV1, Zaaiplaats Solar PV1, Ratpan Solar PV1), and grid connection infrastructure connecting the facilities to the existing Mercury Substation or existing Eskom Transmission lines.

Infrastructure associated with the Vlakfontein Solar PV1 Facility will include the following:

Infrastructure	Specifications
Solar PV Array	<p>The Solar PV Array includes the following components:</p> <ul style="list-style-type: none"> • Bifacial PV Modules • Mounting structures using single axis tracking technology • Inverters • Transformers • Cabling between panels • Total PV area is approximately 151 ha.
Onsite 132 kV Independent Power Producer (IPP) Substation	<p>The IPP Substation includes the following components:</p> <ul style="list-style-type: none"> • HV Step-up transformer • MV Interconnection building • Total area approximately 100 m x 100 m (1 ha)
Access and internal roads	<ul style="list-style-type: none"> • Main access to the IPP substation area is required directly off Vermaasdrift Road (S643), approximately 8m wide. The length of the road is approximately 498 m. The coordinates of the access point are: 27° 0'36.07"S 26°51'19.21"E • Existing internal farm roads to be utilised where possible, • Internal roads to be constructed up to 6m wide. • Regraveling of roads to take place if required by the provincial roads authority.
Laydown area	<ul style="list-style-type: none"> • A temporary construction site area of approximately 4ha directly adjacent to the IPP and Eskom substation will be required. • All temporary infrastructure will be rehabilitated following the completion of the construction phase, where it is not required for the operation phase.
Battery Energy Storage System (BESS)	<ul style="list-style-type: none"> • Solid State Batteries (SSB) is the preferred battery technology • It will be constructed on approximately 4.5 ha.
Storage of Dangerous Goods	<ul style="list-style-type: none"> • Storage of dangerous goods (Including lubrications, oils, paints, fuel/diesel, etc.) with a combined capacity not exceeding 80 cubic metres is required. • Diesel/fuel is generally required for the following purposes: <ul style="list-style-type: none"> ▪ During construction for construction vehicles as well as generators for the construction camp and commissioning whilst waiting for the

	<p>Eskom grid connection works to be completed</p> <ul style="list-style-type: none"> ▪ During operations, diesel is required for vehicles at the PV plant as well as for backup diesel generators at the substation. The Generators supply auxiliary power to the substation’s protection and communications systems, should there be outages on the grid. This is an Eskom requirement together with a battery room at the substations to act as UPS for these critical systems.
Ancillary Facilities	<ul style="list-style-type: none"> • Operations and Maintenance Building • Site Offices • Construction camps • Storage Warehouse • Workshop • Guard House • Ablutions with conservancy tanks • During the construction phase, temporary sanitation facilities will be provided (i.e. chemical toilets) and these toilets will be regularly serviced by a licensed company.

Table 2 Project Components

It is the developer’s intention to bid the proposed project under the Department of Mineral Resources and Energy’s (DMRE’s) Renewable Energy Independent Power Producer Procurement (REIPPP) Programme (or similar programme), with the aim of evacuating the generated power into the national grid. This will aid in the diversification and stabilisation of the country’s electricity supply, in line with the objectives of the Integrated Resource Plan (IRP), with Vlakfontein Solar PV1 set to inject up to 100 MW into the national grid.

2.4 Site Layout Map

Refer also to Appendix A(a) for copy of this map

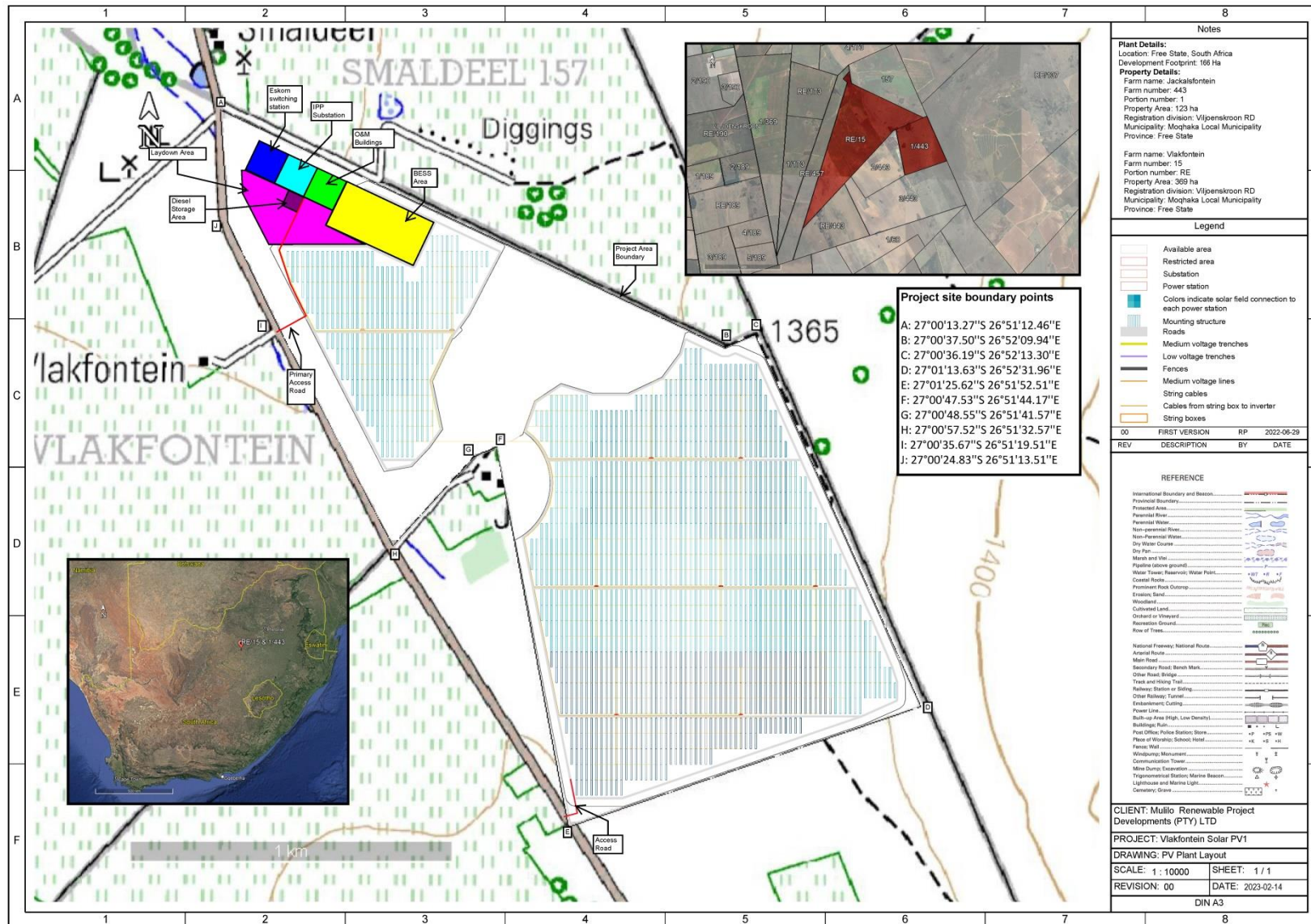


Figure 4 Site Layout Map

2.5 Environmental Sensitivity and Constraints Map

The layout of the **Vlakfontein Solar PV1** facility was influenced mainly by the following constraints and environmental sensitivities:

- The main access point is provided directly off Vermaasdrift Road (S643) and in compliance with the requirements of the relevant traffic authorities.
- A combined delineated aquatic area with buffer zone, biodiversity terrestrial, avi-fauna and bat sensitivity area with relevant buffer zones had been identified and is excluded from the development footprint area.
- The visual impact specialist requires a 30m non-development buffer off Vermaasdrift Road.
- The heritage specialist requires a 200m buffer circle around the existing farmstead to be excluded from the development footprint area. It was also recommended that tree avenues located along roads and farm boundaries be retained as far as possible.
- The layout has also been guided by best practice and acceptable solar PV engineering principles.

Vlakfontein Solar PV1 on the Remainder of Vlakfontein No 15 and Portion 1 of Jackalsfontein No 443
Combined Environmental Sensitivity Map

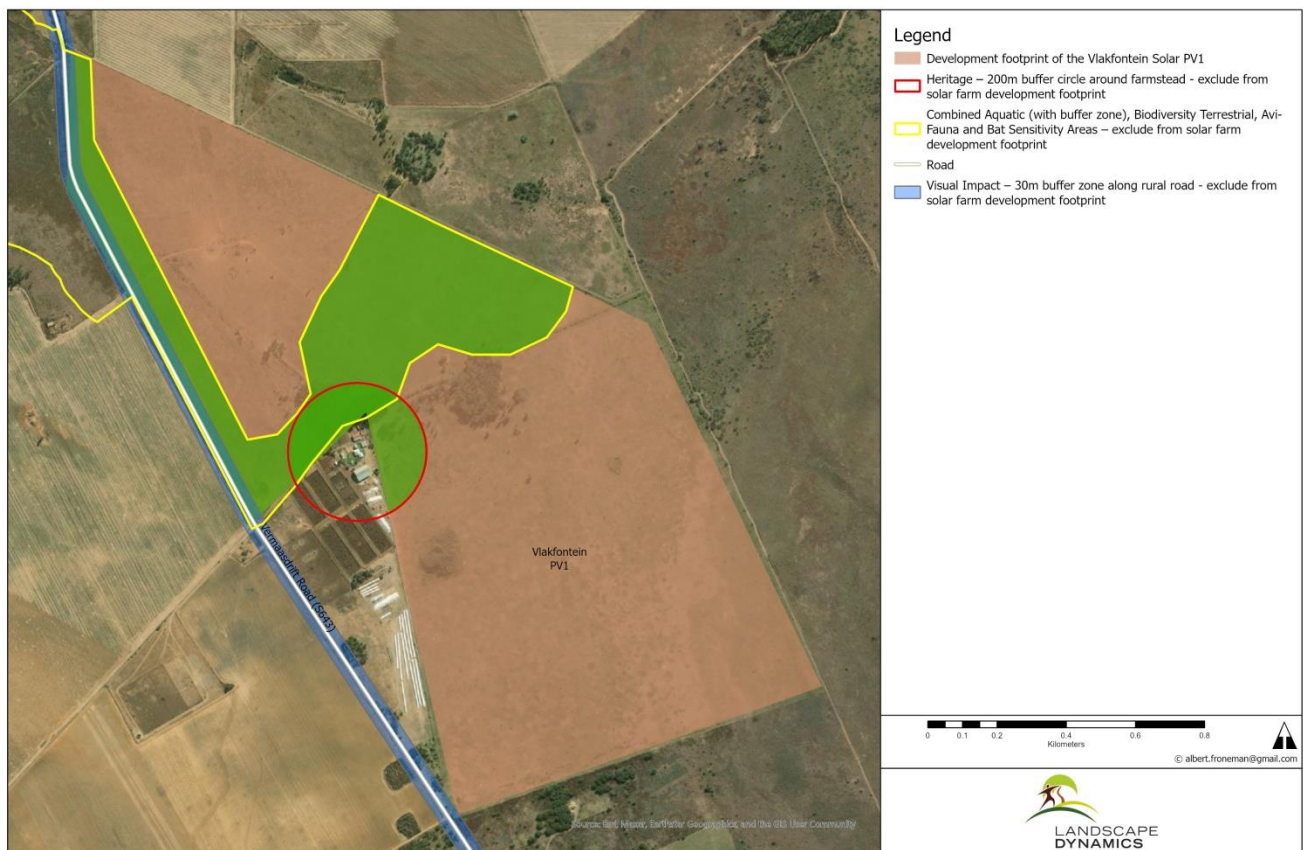


Figure 5 Environmental Sensitivities and Constraints Map

CHAPTER 3: COMPLIANCE WITH LEGAL REQUIREMENT

3.1. NEMA: Legal Requirement of an EMPr

According to Appendix 4 of the NEMA 2014 Regulations, as amended, an EMPr must comply with section 24N of the Act as per the table below.

Regulation Requirement	Section in EMPr where addressed
a) details of (i) the EAP who prepared the EMPr; and (ii) the expertise of that EAP to prepare an EMPr, including a curriculum vitae;	Section 1.5 Appendix B
b) a detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description	Section 2.3
c) a map at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that any areas that should be avoided, including buffers	Section 2.5 Appendix A
d) a description of the impact management objectives, 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- <ul style="list-style-type: none"> (i) planning and design; (ii) pre-construction activities; (iii) construction activities; (iv) rehabilitation of the environment after construction and where applicable post closure; and (v) where relevant, operation activities 	Chapter 6 Chapter 7 Chapter 8
e) a description and identification of impact management outcomes required for the aspects contemplated in paragraph (d)	Chapter 6 Chapter 7 Chapter 8
f) the method of monitoring the implementation of the impact management actions contemplated in paragraph (f);	Chapter 6 Chapter 7 Chapter 8
g) the frequency of monitoring the implementation of the impact management	Chapter 6

actions contemplated in paragraph (f);	Chapter 7 Chapter 8
h) an indication of the persons who will be responsible for the implementation of the impact management actions;	Chapter 6 Chapter 7 Chapter 8
i) the time periods within which the impact management actions contemplated in paragraph (f) must be implemented;	Chapter 6 Chapter 7 Chapter 8
j) the mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f);	Chapter 6 Chapter 7 Chapter 8
k) a program for reporting on compliance, taking into account the requirements as prescribed by the regulations	Section 4.5 Section 5.3 Section 5.4
l) an environmental awareness plan describing the manner in which- (i) the applicant intends to inform his or her employees of any environmental risk which may result from their work; and (ii) risks must be dealt with in order to avoid pollution or the degradation of the environment	Section 4.4 Section 4.6 Section 4.9
m) any specific information that may be required by the competent authority.	To be included after issuing of the EA

Table 3: NEMA Appendix 4: Content of EMPr

3.2. NEMA: Listed Activities

The Environmental Authorisation will be obtained in terms of the National Environmental Management Act, 1998 (Act No 107 of 1998) (NEMA) and the Environmental Impact Assessment Regulations published in Government Notice No. R.982 of December 2014, as amended and Environmental Authorisation was requested for the following listed activities:

Listing Notice 1		
11	The development of facilities or infrastructure for the transmission and distribution of electricity (i) <u>Outside urban areas or industrial complexes with a capacity of more than</u>	An onsite 132 kV Independent Power Producer (IPP) Substation forms part of the project components for which Environmental Authorisation is required with this application.

	<p><u>33 but less than 275 kilovolts; or</u> (ii) Inside urban areas or industrial complexes with a capacity of 275 kilovolts or more.</p>	
12	<p><u>The development of—</u> (i) dams or weirs, where the dam or weir, includ (ii) <u>infrastructure or structures with a physical footprint of 100 square metres or more;</u> <u>where such development occurs—</u> (a) <u>within a watercourse;</u> (b) in front of a development setback; or (c) if no development setback exists, within 32 m excluding— (aa) the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour; (bb) where such development activities are related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies; (cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 14 in Listing Notice 3 of 2014, in which case that activity applies; (dd) where such development occurs within an urban area; (ee) where such development occurs within existing roads, road reserves or railway line reserves; or (ff) the development of temporary infrastructure or structures where such infrastructure or structures will be removed within 6 weeks of the commencement of development and where indigenous vegetation will not be cleared</p>	<p>An existing access road will be upgraded and developed across a seepage area. This road will be approximately 6m in width and approximately 265m in length where it crosses the seepage area. A surface area of at least 1 590m² will ultimately be affected.</p>
19	<p>The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shell grot, pebbles or rock of more than 10 cubic metres from a watercourse, but excluding where such infilling, depositing, dredging, excavation, removal or moving— a) will occur behind a development setback;</p>	<p>An existing road will be upgraded and developed across the seepage area. It will be approximately 6m in width and approximately 265m in length. A surface area of at least 1 590m² will ultimately be affected; therefore infilling or depositing of more than 10m³ will be required.</p>

	<ul style="list-style-type: none"> b) is for maintenance purposes undertaken in accordance with a maintenance management plan; c) falls within the ambit of activity 21 in this Notice, in which case that activity applies; d) occurs within existing ports or harbours that will not increase the development footprint of the port or harbour; or e) where such development is related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies. 	
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28	<p>Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture, game farming, equestrian purposes or afforestation on or after 01 April 1998 and where such development:</p> <ul style="list-style-type: none"> (i) will occur inside an urban area, where the total land to be developed is bigger than 5 hectares; or (ii) <u>will occur outside an urban area, where the total land to be developed is bigger than 1 hectare;</u> <p>excluding where such land has already been developed for residential, mixed, retail, commercial, industrial or institutional purposes.</p>	<p>The development footprint of the Vlakkfontein Solar PV1 facility will be developed on approximately 151 ha of which contained areas previously cropped and uncropped outside an urban area.</p>
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Listing Notice 2

Even though Listing Notice 2 calls for a full Scoping and EIA to be undertaken, the project site falls within a Renewable Energy Zone (Klerksdorp REDZ) which implies that a Basic Assessment process has to be undertaken regardless if Listing Notice 2 is triggered or not.

1	<p>The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more, excluding where such development of facilities or infrastructure is for photovoltaic installations and occurs</p> <ul style="list-style-type: none"> (a) within an urban area; or (b) on existing infrastructure. 	<p>A solar PV facility of up to 100MW with associated infrastructure will be constructed outside an urban area.</p>
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15	<p>The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for</p> <p>(i) the undertaking of a linear activity; or maintenance purposes undertaken in accordance with a maintenance management plan</p>	<ul style="list-style-type: none"> • The combined properties' size is 493 ha in extent of which the development footprint will affect approximately 151 ha of previously cropped and uncropped land. • Indigenous vegetation of more than 20 ha will be removed within the total project area.
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Listing Notice 3

4	<p>The development of a road wider than 4 metres with a reserve less than 13,5 metres.</p> <p>b. Free State</p> <p>i. Outside urban areas: (gg) Areas within 10 kilometres from national parks or world heritage sites <u>or 5 kilometres from any other protected area identified in terms of NEMPAA</u> or from the core areas of a biosphere reserve, excluding disturbed areas</p>	<p>Listing Notice 3 is applicable because the development site lies outside urban areas; and</p> <ul style="list-style-type: none"> ○ according to the DFFE Screening Tool Report the entire site falls within a Critical Biodiversity Area. ○ according to the Protected Areas Register the Mispah Game Farm (Nature Reserve) is situated approximately 1,2km north-west of the PV site. <p>The activity is applicable because:</p> <ul style="list-style-type: none"> • The main access to the IPP substation area will be off the Vermaasdrift Road (S643). • This access road will be constructed to a width of approximately 8m. • All other internal roads will be constructed to approximately 6m width.
10	<p>The development and related operation of facilities or infrastructure, for the storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of 30 but not exceeding 80 cubic metres.</p> <p>b. Free State</p> <p>i. Outside urban areas (gg) Areas within 10 kilometres from national parks or world heritage sites <u>or 5 kilometres from any other protected area identified in terms of NEMPAA</u> or from the core areas of a biosphere reserve</p>	<ul style="list-style-type: none"> • Listing Notice 3 is applicable because according to the Protected Areas Register the Mispah Game Farm (Nature Reserve) is situated approximately 5km west of the PV site. <p>The relevant activities are:</p> <ul style="list-style-type: none"> • Storage of dangerous goods (Including lubrications, oils, paints, fuel/diesel. etc.) with a combined capacity not exceeding 80 cubic metres will be required. • Diesel/fuel is generally required for the following purposes: <ul style="list-style-type: none"> ○ During construction for construction vehicles as well as generators for the construction camp and commissioning whilst waiting for the Eskom grid connection works to be completed ○ During operations required for Operations & Maintenance vehicles at

		<p>the PV plants but also required for backup diesel generators at the substation. The Generators supply auxiliary power to the substation's protection and communications systems, should there be outages on the grid. This is an Eskom requirement together with a battery room at the substations to act as UPS for these critical systems.</p>
12	<p>The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan.</p> <p>b. Free State</p> <p>i. Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004;</p> <p>ii. Within critical biodiversity areas identified in bioregional plans;</p> <p>iv. Areas within a watercourse or wetland; or within 100 metres from the edge of a watercourse or wetland.</p>	<p>Listing Notice 3 is applicable because:</p> <ul style="list-style-type: none"> • according to the DFFE Screening Tool Report, the entire site is situated within a Critical Biodiversity Area and an Endangered Ecosystem. • a watercourse affects the site and PV solar panels as well as roads will be constructed that requires clearance of indigenous vegetation exceeding 300m² to take place within 100m from the edge of the delineated watercourse. <p>Activity 12 is applicable because:</p> <ul style="list-style-type: none"> • the development footprint will affect approximately 160 ha of previously cropped and uncropped land indigenous vegetation of way more than 300m² will be removed. • A watercourse runs through the middle of the site. Clearance will thus be required for the PV facility within 100m from the edge of the watercourse.
14	<p><u>The development of</u></p> <p>(i) dams or weirs, where the dam or weir, including infrastructure and water surface area exceeds 10 square metres; or</p> <p>(ii) infrastructure or structures with a physical footprint of 10 square metres or more; where such development occurs</p> <p>(a) within a watercourse;</p> <p>(b) in front of a development setback; or</p> <p>(c) if no development setback has been adopted within 32 metres of a watercourse, measured from the edge of a watercourse; excluding the development of infrastructure or structures within existing ports or harbours</p>	<p>Listing Notice 3 is applicable because according to the Protected Areas Register the Mispah Game Farm (Nature Reserve) is situated approximately 5km west of the PV site.</p> <p>Activity 14 is applicable because an old drainage line in the southern block of the PV plan will be developed with PV infrastructure and internal roads.</p>

	<p>that will not increase the development footprint of the port or harbour.</p> <p>b. Free State</p> <p>i. Outside urban areas</p> <p>(hh) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve</p>	
18	<p>The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre.</p> <p>b. Free State</p> <p>i. Outside urban areas:</p> <p>(aa) A protected area identified in terms of NEMPAA, excluding conservancies;</p> <p>(bb) National Protected Area Expansion Strategy Focus areas;</p> <p>(cc) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority;</p> <p>(dd) Sites or areas identified in terms of an international convention;</p> <p>(ee) <u>Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;</u></p> <p>(ff) Core areas in biosphere reserves;</p> <p>(gg) Areas within 10 kilometres from national parks or world heritage sites <u>or 5 kilometres from any other protected area identified in terms of NEMPAA</u> or from the core area of a biosphere reserve; or</p> <p>(hh) Areas within a watercourse or wetland; <u>or within 100 metres from the edge of a watercourse or wetland;</u> or</p> <p>ii. Inside urban areas:</p> <p>(aa) Areas zoned for use as public open space; or</p>	<p>Listing Notice 3 is applicable because the development site lies outside urban areas; and</p> <ul style="list-style-type: none"> ○ according to the DFFE Screening Tool Report the entire site falls within a Critical Biodiversity Area. ○ according to the Protected Areas Register the Mispah Game Farm (Nature Reserve) is situated approximately 1,2km north-west of the PV site ○ some of the project components will be constructed within 100m from the edge of the a watercourse or wetland <p>Activity 18 is applicable because existing roads (i.e. the access road) will be widened by more than 4 metres and/or lengthened by more than 1km within 100m from the edge of a watercourse / wetland.</p>

(bb) Areas designated for conservation use in Spatial Development Frameworks adopted by the competent authority or zoned for a conservation purpose.

Table 4 Relevant NEMA Listed Activities

3.3. NEMA: Conditions of the Environmental Authorisation

The EA will be issued with certain conditions pertaining to the EMPr. Once received, these conditions should be listed under this paragraph and an indication must be given where in the EMPr the specific condition has been complied to.

3.4. NEMA: Implementation of the Generic EMPr for Substation

The Generic EMPr relevant to an application for substation and overhead electricity transmission and distribution infrastructure which require environmental authorisation as identified in terms of Section 24(2) of the Act (published on 22 March 2019) must be implemented. This includes the relevant signed part of the EMPr as approved by the DFFE.

This Generic EMPr is only relevant to the construction of onsite 132 kV Independent Power Producer (IPP) Substation associated with this project. The National Water Act (Act No 36 of 1998)

3.1. The National Water Act (Act No 36 of 1998)

The National Water Act (Act No 36 of 1998) (NWA) aims to regulate the use of water and activities which may impact on water resources through the categorisation of 'listed water uses', encompassing water abstraction and flow attenuation within catchments as well as the potential contamination of water resources. The Department of Water and Sanitation (DWS) is the administering body in this regard. Defined water use activities require the approval of DWS in the form of a General Authorisation (GA) or a Water Use Licence (WUL).

As some of the proposed activities could affect the delineated aquatic features, they pose a risk of changing the bed, banks or characteristics of the watercourses or impeding or diverting flow in the watercourses, with the associated Section 21 (c) and (i) water use activities.

Additional water use activities that may occur would be associated with groundwater abstraction. The threshold for the storage of domestic and biodegradable industrial wastewater for the purpose of disposal is 10 000 m³ per property. The General Authorisations for groundwater abstraction within the Quaternary Catchment C24B is limited to 45 m³/ha for the extent of the associated properties.

The application for a GA / WUL can only be made once Preferred Bidder status for this project has been awarded.

3.2. The National Heritage Resources Act (Act 25 of 1999)

The proposed project falls within the scope of Section 38 of the National Heritage Resources Act and the most obvious applicable activity is 'any development or other activity which will change the character of a site exceeding 5 000m² in extent'.

The authorisation process in terms of the NHRA forms part of the EIA process. A Heritage Impact Assessment was electronically submitted to the South Africa Heritage Resource Agency (SAHRA) via SAHRIS as well as to the Free State Provincial Heritage Resources Authority as part of the public participation programme. Comment received from these authorities will be addressed and included in the Final BAR.

3.3. Department of Agriculture, Land Reform & Rural Development

A renewable energy facility requires approval from the National Department of Agriculture, Land Reform and Rural Development (DALRRD) if the facility is on agriculturally zoned land. There are three approvals that *may* apply:

- No Objection letter;
- Consent for Long Term Lease in terms of the Subdivision of Agricultural Land Act (Act 70 of 1970) (SALA); and
- Consent in terms of the Conservation of Agricultural Resources Act (Act 43 of 1983) (CARA)

A **No Objection Letter** for the change in land use is issued by the Deputy Director General (Agricultural Production, Health and Food Safety, Natural Resources and Disaster Management) and is required as a first step in the agricultural approval process. This letter is also one of the requirements for receiving municipal rezoning. Application for the No Objection letter has to be made as early as possible in the renewable development process because not receiving this DALRRD approval may be a fatal flaw for a project. This application requires a motivation backed by solid evidence that the development will not significantly compromise the future agricultural production potential of the development site. Note that a positive EA does not assure DALRRD's approval of the development. A No Objection letter was received for this project and the DALRRD conditions must be met.

The second required approval is **Consent for Long-Term Lease in terms of the Subdivision of Agricultural Land Act (Act 70 of 1970) (SALA)**. If DALRRD's approval for the development has already been obtained in the form of the No Objection letter, then SALA approval should not present any difficulties. SALA approval (if required) can only be applied for once the Municipal Rezoning Certificate and EA is in hand.

Consent in terms of the **Conservation of Agricultural Resources Act (Act 43 of 1983) (CARA)** is required for the cultivation of virgin land. Cultivation is defined in CARA as "any act by means of which the topsoil is disturbed mechanically". The purpose of this consent for the cultivation of virgin land is to ensure that only land that is suitable as arable land is cultivated. Therefore, despite the above definition of cultivation, disturbance to the topsoil that results from the construction of a renewable energy facility and its associated infrastructure does not constitute cultivation as it is understood in CARA. This statement was corroborated by the Acting Scientific Manager: Natural Resources Inventories and Assessments in the Directorate: Land and Soil Management of DALRRD. The construction and operation of the proposed Vlakfontein Solar PV1 facility will therefore not require consent from the Department of Agriculture, Land Reform and Rural Development in terms of this provision of CARA.

3.4. Permits and Plans Required Before Construction May Commence

Specific plans, policies, programmes and permits need to be compiled and obtained before construction

may commence and must be included in the Final and Updated EMP. Tables 5-7 below provides a reference list of these requirements.

3.7.1. Fauna & flora aspects

The following plans would need to be compiled to manage the **fauna & flora aspects** of the proposed Vlakfontein Solar PV1 facility:

Ecological Component	Plans, policies, programmes and permits required	Phase that the plan should be implemented
Flora	Plant rescue and protection plan	Planning & Design Phase
Flora	Open space management plan	Operational Phase
Flora	Rehabilitation Plan / Habitat Restoration Plan	After construction but before the commencement of the Operational Phase. Some overlapping between phases is
Flora	Alien Invasive Management Plan	Operational Phase
Avifauna	Due to the low sensitivity for birds in the area, avifauna monitoring programmes are not required	Not applicable

Table 5: Plans to manage the fauna & flora aspects of the development

3.7.2. Aquatic and hydrological aspects

The following plans would need to be compiled to manage the **aquatic aspects and hydrology (storm water)** of the proposed Vlakfontein Solar PV1 facility

Aquatic Component	Plans, policies, programmes and permits required	Phase that the plan should be implemented
Surface water	Storm Water Management Plan	Construction Phase Planning and Design Phase

Aquatic Component	Plans, policies, programmes and permits required	Phase that the plan should be implemented
Registration of a water use (Water Use License)	Application must be made to DWS to register any water uses – confirmation to be provided during the final design phase:	Planning and Design Phase

Table 6: Plans to manage the aquatic and hydrological aspects of the development

3.7.3. Traffic and road aspects

The following plans would need to be compiled to manage the **traffic and roads aspects** of the proposed Kleinfontein Solar PV1 facility:

Traffic Component	Plans, policies, programmes and permits required	Phase that the plan should be implemented
Roads	<ul style="list-style-type: none"> • Permits for any abnormal loads. • Engineering design of new access roads. • Access approval from the relevant road authority 	Planning and Design Phase

Table 7 Requirement to manage the traffic and roads aspect of the development

3.7.4. Social aspects

The following plans would need to be compiled to manage the **social aspects** of the proposed Vlakfontein Solar PV1 facility – also refer to the Social Impact Assessment undertaken for this project for more detail regarding the content of these plans:

Social Component	Plans, policies, programmes and permits required	Phase that the plan should be implemented
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Social Component	Plans, policies, programmes and permits required	Phase that the plan should be implemented
Socio-Economic	<ul style="list-style-type: none"> • Local Employment Policy and Training Programme • Skills Development and Training Programme • Code Of Conduct for Contractors and Construction Workers • Stakeholder Engagement Plan • Community Health, Safety and Security Plan • Monitoring Forum • Community Trust 	Construction Phase as well as Operational Phase

Table 8 Plans to manage the socio-economic aspects of the development

3.7.5. Battery Energy Storage System (BESS)

Prior to bringing any solid-state battery containers into the country, the following plans would need to be compiled to manage the **BESS** of the proposed Vlakfontein Solar PV1 facility:

BESS Component	Plans, policies, programmes and permits required	Phase that the plan should be implemented
Design	The design should be subject to a full Hazard and Operability Study (HAZOP) prior to commencement of procurement. A HAZOP is a detailed technical systematic study that looks at the intricacies of the design, the control system, the emergency system etc. and how these may fail under abnormal operating conditions. Additional safeguards may be suggested by the team doing the study.	Construction Phase as well as Operational Phase

BESS Component	Plans, policies, programmes and permits required	Phase that the plan should be implemented
<p>Safety, Health & Environmental Risk Assessment</p>	<p>The Applicant and Project Engineers must ensure that they integrate the findings and recommendation of the high level Safety, Health & Environmental Risk Assessment (SHERA) undertaken by ISHECON Chemical Process Safety Engineers for the project, dated 27 May 2022. Contact person: Debra Mitchell, tel 011 201 4783/5 mitcheld@ishecon.co.za</p> <p>It was recommended by the specialists that the risk assessment be updated once the technology has been chosen and more details of the actual design are available,</p>	<p>Construction Phase as well as Operational Phase</p>
<p>Design</p>	<p>The design should be subject to a full Hazard and Operability Study (HAZOP) prior to commencement of procurement. A HAZOP is a detailed technical systematic study that looks at the intricacies of the design, the control system, the emergency system etc. and how these may fail under abnormal operating conditions. Additional safeguards may be suggested by the team doing the study.</p>	<p>Construction Phase as well as Operational Phase</p>
<p>Emergency Response</p>	<p>An Emergency Response Plan should be in place that would be applicable for the full route from the ship to the site. This plan would include details of the most appropriate emergency response to fires both while the units are in transit and once they are installed and operating.</p>	<p>Construction Phase as well as Operational Phase</p>
<p>Handling, repurposing or disposal of batteries, modules and containers</p>	<p>An End-of-Life plan should be in place for the handling, repurposing or disposal of dysfunctional, severely damaged batteries, module and containers.</p>	<p>Operational and Decommissioning Phase</p>

BESS Component	Plans, policies, programmes and permits required	Phase that the plan should be implemented
Implementation of mitigation measures	Implementation measures provided in the SHERA and the HAZOP	From the details of accidents that have happened with BESS installations in general, it is clear that many potential problems manifest during the commissioning phase when units are first powered up to test functionality. This phase is critical and <u>all controls, procedures, mitigation measures etc that would be in place for full operation should be in place before</u>

Table 9 Plans to manage the BESS

4.1 Holder of the Environmental Authorisation

The EA Holder will

- be responsible for the overall implementation of this EMPr;
- ensure that all third parties (i.e. Contractors; suppliers, etc.) comply with the requirements of this EMPr. The relevant specifications of the EMPr must be included in all contracts with the Contractors;
- appoint an ECO to be permanently on site;
- ensure that all future owners (if and when applicable) are well aware of their legal responsibilities in terms of development and operation of the PV facility.

4.2 Contractor(s)

- The Contractor must ensure that the EMPr is being followed at all times. It is the responsibility of the Contractor to ensure that its subcontractor(s) received a copy of this EMPr and that all aspects thereof are understood and adhered to.
- The Contractor must ensure that all subcontractors receive environmental awareness training before work commences on site. The ECO may be approached for assistance in this regard.
- The Contractor will be responsible for any environmental damages caused by its staff or subcontractors. Spill treatment, clean-up operations and other corrective actions are the responsibility of the Contractor.

4.3 Environmental Control Officer

A permanently on-site, independent ECO needs to be appointed for the duration of the construction period. The primary role of the ECO is to act as an independent quality controller and should monitor project compliance with the conditions of the EA, environmental legislation and the recommendations and stipulations as contained in this EMPr.

Furthermore, the duties of the ECO shall include, inter alia, the following:

- Checking that the necessary environmental authorisations and permits, if any, has been obtained;
- Conducting environmental awareness training to all contractors as well as subcontractors;
- Undertaking daily site inspections;
- Advising the Contractor on environmental issues within defined construction areas, with reference to the approved EMPr and EA;
- Reporting any environmental issues/incidents to DFFE;
- Attending regular site meetings;
- Make reasonable amendments to the EMPr in co-operation with the contractor and EA Holder where and when required;

- Completing weekly environmental checklists, the format of which must be approved by the EA Holder and Project Engineer.
- Keeping photographic records of progress on site which should be included in the weekly site inspection reports;
- Enforcing penalties for non-compliance – penalties must be determined by the ECO in cooperation with the EA Holder before construction commences;
- Ensuring that corrective actions are taken in the case of non-compliance;
- Keeping records, written and photographic, of all corrective actions taken;
- Remain employed until all rehabilitation measures as required for implementation due to construction damage, are completed and the site is handed over to the EA Holder by the contractor;
- Any conservation authority/institution as listed in the List of Interested and Affected Parties for the project should be allowed reasonable access to the construction site on request and arrangement with the ECO and the contractor.

4.4 Environmental Training and Awareness

The Contractor will ensure that its employees as well as all sub-contractors are adequately trained with regard to the implementation of the EMPr, as well as regarding environmental legal requirements and obligations. All employees should have an induction presentation on environmental awareness. Where possible the presentation will be conducted in the language of the employees. Construction workers and Site Supervisors and Site and Project Managers should receive different training modules specifically designed for the needs of the different skill levels of workers.

The environmental training should, as a minimum, include the following:

- The role of the ECO;
- The importance of conforming with relevant environmental policies, procedures, plans and systems;
- The significant environmental impacts, actual or potential, which could result from their work activities;
- The environmental benefits of improved personal performance;
- The roles and responsibilities in achieving conformance with the environmental policy and procedures, including emergency preparedness and response requirements;
- The potential consequences of departure from specified operating procedures;
- The mitigation measures to be implemented when carrying out their work activities;
- The importance of not littering;
- The need to use water sparingly;
- Details of, and encouragement to, minimising the production of waste and re-use, recover and recycle waste where possible;
- Penalties for non-compliance should be clearly communicated;
- Details regarding archaeological and/or historical sites which may be unearthed during construction and the procedures to be followed should these be encountered;
- Description of how to carry out protocols enclosed within the EMPr;
- What to do in the event of a hydrocarbon spill;
- The following aspects should be emphasised:
 - Removal of agricultural products is prohibited
 - No plants may be collected

- No firewood may be collected
- No open fires are to be made
- No wandering on adjacent properties is allowed
- No access to the watercourse areas is allowed
- No watercourse may be used for any purpose (i.e. drinking water, washing, etc.)
- The veld may not be used for any toilet needs.

Follow-up training courses must be attended throughout the construction period as deemed necessary by the ECO.

4.5 Environmental Audits

In terms of Regulation 34 of the NEMA EIA Regulations, 2014, the holder must conduct environmental audits to determine compliance with the conditions of the Environmental Authorisation, the EMPr and submit Environmental Audit Reports to the Competent Authority. The Environmental Audit Report must contain all the information required in Appendix 7 of the NEMA EIA Regulations, 2014 as amended.

The objective of the Audit Reports is to:

- a) report on
 - the level of compliance with the conditions of the EA and the EMPr
 - the extent to which the avoidance, management and mitigation measures provided for in the EMPr achieve the objectives and outcomes of the EMPr;
- b) identify and assess any new impacts and risks as a result of undertaking the activity;
- c) evaluate the effectiveness of the EMPr, and where applicable;
- d) identify shortcomings in the EMPr; and
- e) identify the need for any changes to the avoidance, management and mitigation measures provided for in the EMPr.

Internal audits

Internal monthly audit reports must be compiled by the ECO and submitted to the EA Holder as well as the DFFE as per conditions in the EA. These reports must include, as a minimum, the weekly site inspection reports, all applicable photographic evidence, incident registers, corrective actions taken (if applicable), non-compliance directives issued and notes and minutes of site meetings.

External audits

An external audit must be undertaken by suitably qualified Environmental Assessment Practitioner / independent environmental auditor (note: these audits cannot be undertaken by the ECO) as follows, unless stated otherwise in the EA:

- Quarterly during the entire construction period
- Within 30 days after completion of the construction phase
- Within 30 days after completion of the rehabilitation phase
- Within one year after commencement of the operational phase
- Every 5 years thereafter for the duration of the operational lifespan of the facility.

4.6 Emergency Preparedness Plan

The Contractor and/or EA Holder must ensure that there will be an appropriate response to unexpected and/or accidental actions or incidents that will cause environmental impacts throughout the life cycle of the project. Such incidents may include, inter alia:

- Accidental discharges to the land;
- Accidental exposure of employees to hazardous substances;
- Accidental spillage of hazardous substances; and
- Specific environmental and ecosystem effects from accidental releases or incidents.

The Emergency Preparedness Plan shall, as a minimum, include the following:

- Contact details of the EA Holder, ECO, Project Manager and Project Engineer;
- Roles and responsibilities, accountability and liability of personnel;
- Internal and external communication plans, including prescribed reporting procedures;
- Actions to be taken in the event of different types of emergencies must be provided in a step-by-step format;
- The Emergency Preparedness Plan for all major and minor incidents must be made available to all relevant role players on site;
- Incident management protocols should include considerations for air, groundwater, soil and surface water;
- A copy of the Emergency Preparedness Plan must be available and easily accessible at the main site office;
- Information on hazardous materials, including the potential impact associated with each, and measures to be taken in the event of accidental release shall be listed;

Further to the above, the following is also applicable:

- The Contractor and the EA Holder will comply with the emergency preparedness, and incident and accident-reporting requirements, as required by the Occupational Health and Safety Act, 1993 (Act No 85 of 1993), the National Environmental Management Act, 1998 (Act No 107 of 1998), the National Water Act, 1996 (Act No 36 of 1996) and the National Veld and Forest Fire Act, 1998 (Act No 101 of 1998) as amended, and/or any other relevant legislation;
- Details of emergency services (e.g. the fire department, spill clean-up services, etc.) shall be listed and prominently displayed in various locations on site;
- Spill clean-up kits and absorbent material must be kept on site to assist in immediate clean-up of any hazardous material spillages; and
- Construction and permanent employees shall be adequately trained in terms of incidents and emergency situations.

4.7 Method Statements

- On request of the Project Engineer and/or ECO (the ECO must however first discuss this with the Project Engineer), the Contractor must compile a Method Statement in such detail that the Project Engineer/ECO will be able to assess whether the Contractor's proposal is in accordance with the stipulations as per the EMPr and/or will produce results in accordance with the EMPr stipulations. The Method Statement may cover applicable details with regard to:

- construction procedures,
 - materials and equipment to be used,
 - getting the equipment to and from site,
 - how the equipment/ material will be moved while on site,
 - how and where material will be stored,
 - the containment (or action to be taken if containment is not possible) of leaks or spills of any liquid or material that may occur,
 - timing and location of activities,
 - any other information deemed necessary by the Project Engineer/ECO (i.e. detail with regards to ablution facilities; storage, handling and disposal procedures of all hazardous materials to be stored on site; management of contaminated water, etc.).
- Method Statements typically cover aspects such as
 - Vegetation clearing;
 - Site establishment – Site offices, lay-down and storage areas;
 - Waste management – transport, storage, segregation, classification, disposal
 - Hazardous materials storage;
 - Hazardous spills clean up;
 - Hazardous waste management;
 - Cement mixing;
 - Topsoil stockpiling management;
 - Water use (source, abstraction and disposal); and
 - Dust and noise management.
 - The Contractor may not commence the activity until the Method Statement has been approved.
 - The Project Engineer/ECO may require changes to the Method Statement if the proposal does not comply with the stipulations or if, in the reasonable opinion of the Project Engineer/ECO, the proposal may result in, or carries a greater than reasonable risk of, damage to the environment in excess of that permitted by the EMPr or other applicable legislation.
 - Approved Method Statements shall be readily available on the site and shall be communicated to all relevant personnel.
 - The Contractor shall carry out the works in accordance with the approved Method Statement. Approval of the Method Statement shall not absolve the Contractor from any of his obligations or responsibilities in terms of the contract entered into between the EA Holder and Contractor.

4.8 Reporting Structure

All incidents, i.e. oil spills, complaints from IAPs, etc. must be reported to the ECO. The ECO must liaise with the appropriate person such as the Contractor, Project Manager, Project Engineer or EA Holder to report and solve the issues.

4.9 Incident Reporting and Remedy

An **Emergency Incident** can be defined as an unexpected sudden occurrence, including a major emission, fire or explosion leading to serious danger to the public or potentially serious pollution of or detriment to the

environment, whether immediate or delayed. It is also an accident involving the spilling of a harmful substance that finds or may find its way into a water resource.

An **Environmental Incident** can be defined as pollution, erosion, cutting of protected and/or indigenous trees, hazardous substance spillages, wildlife interactions, public complaints and loss of biodiversity caused by Eskom Distribution's activities, as well as non-compliance to legislation such as Environmental Authorisations, permits and licences.

Incident Management – Aims and objectives

The aims and objectives of incident management are as follows:

- Reduce risk and prevent any recurrence of incidents
- Ensure incidents are managed effectively
- Ensure incidents are classified and recorded accurately
- Ensure prompt and appropriate investigation
- Promote the proactive use and value of near-miss occurrence reporting
- Improve the quality of safety and the work environment by learning from incidents, including near miss occurrences
- Share incident information with all site personnel and other subcontractors
- Report to relevant authorities as appropriate
- Promote the analysis of trends and review practices accordingly

Incident Reporting

After becoming aware of an incident, the following should be done:

- All incidents must be reported via a flash report within 24 hours or end of shift, regardless of the severity of the incident. Once an employee identifies that an incident has occurred, he/she must immediately notify his/her supervisor of such an incident, regardless of its severity, so that an appropriate and timely response can be made, an initial evaluation conducted, and an incident classification made.
- The responsible supervisor shall then send a flash report to the ECO and Project Manager within 24 hours of the incident. Thereafter, it will be determined by the ECO if reporting to the authorities is required.
- Immediate clean-up action is required.

Hazardous Waste - Incident Reporting

If a leakage or spillage of hazardous substances occurs, the local emergency services will be immediately notified of the incident. The location, nature of the load and the status of the site of the accident itself (i.e. whether further leakage is still taking place, whether the vehicle or the load is on fire, etc.) must be provided.

Written records of the corrective and remedial measures decided upon, and the progress achieved therewith over time, must be kept. Such progress reporting will be important for monitoring and auditing purposes. The written reports may be used for training purposes in an effort to prevent similar future occurrences.

Remedy

- The immediate response will be to contain the spill. The exact treatment of polluted soil and/or water must be determined in consultation with the ECO and Project Manager.

- No person shall be allowed to approach a spill, fire, etc. unless he and/or she are equipped with the personal protective clothing and equipment.
- The risk involved shall be assessed before anyone approaches the scene of the incident with the emergency response plan.

5.1 Minimum Content Requirement of the ECO File

An ECO file must be kept on site at all times and should, as a minimum, contain the following:

- Contact details of Key Role Players (EH Holder; Contractors; ECO; Safety & Health Officer)
- Copy of this EMPr
- Copy of the Environmental Authorisation
- Copy of the Water Use Authorisation (if applicable)
- Copy of permits for the removal of plants (if applicable)
- Method Statements (complete and as agreed between the role players)
- Training Material (Handouts for workers and Training notes for contractors, site managers and supervisors)
- Attendance Registers of all Environmental Awareness Training sessions
- Construction working programme
- Detailed photographic evidence of the status quo prior to commencement of construction
- Communication with the DFFE, i.e. notification of commencement of construction and Site Report submission to the DFFE as required in the EA
- Contact Details of key stakeholders in case of emergency (i.e. Landowner, Adjacent Landowners; Department of Water & Sanitation; South African Heritage Resources Authority; Municipal Fire Control Division)
- Waste Management Registers:
 - Chemical Toilets
 - Hazardous Waste
 - General Waste
- Complaints Register
- Environmental Incidents Register
- Non-compliance Register
- Weekly Environmental Checklists to be completed by the ECO
- Notes and minutes of environmental site meetings
- Attendance registers of site meetings

5.2 Photographic Records

The ECO shall keep an electronic database of photographic records which must include, but are not limited to:

- Pictures of all areas designated as work areas, camp areas, development sites and storage areas taken before these areas are set up
- All bunding and fencing
- Road conditions and road verges
- Topsoil storage areas
- All areas to be cordoned off during construction
- Waste management sites
- Ablution facilities (inside and out)
- Any non-conformances deemed to be “significant”
- All completed corrective actions for non-compliances

- All required signage
- Photographic recordings of incidents
- All areas before, during and post rehabilitation
- Include relevant photographs in the Final Environmental Audit Report

5.3 Weekly Environmental Checklist

The Environmental Checklist should include specifications as per the EA and should be completed in collaboration between the ECO, Project Manager, Project Engineer as well as the EA Holder. The Checklist must be included in the ECO file and should form part of the monthly reports that will be submitted to the EA Holder and the DFFE.

Detailed photographic records of actions and incidents that took place during the week must be included in the Environmental Checklist.

Corrective actions (if any) should be clearly stated and communicated to the applicable responsible person. Corrective actions taken during the previous week should be documented and evaluated, the results of which should be communicated to the responsible parties.

5.4 Monthly Environmental Reporting

The ECO must compile a monthly report which will include the weekly Environmental Checklists and photographic records. This report must be submitted to the EA Holder, DFFE, Project Manager and Project Engineer.

5.5 Non-Compliance

The EA Holder will be deemed not to have complied with the EMPr if

- there is evidence of contravention of the EMPr specifications within the boundaries of the construction site, site extensions and access roads
- there is contravention of the EMPr specifications which relate to activities outside the boundaries of the construction site
- environmental damage ensued due to negligence
- construction activities take place outside the defined boundaries of the site
- the EA Holder fails to comply with corrective or other instruction

Penalties for non-compliance

Penalties for non-compliance should be determined by the EA Holder in collaboration with the ECO and Project Manager and should be strictly enforced. The penalty system should be clearly communicated to the Contractor and sub-contractor as well as during environmental awareness training sessions.

Non-compliance notice

A non-compliance notice must be issued by the ECO, in writing, to the responsible Contractor and must be kept in the ECO file.

The non-compliance notice must, as a minimum, include the following:

- Name of responsible Contractor
- Name of worker / staff member who caused the non-compliance (if known)
- Date and time of the non-compliance
- Description of the non-compliance

- Detailed description of recommended remedial action to be taken
- Date when the corrective action should be completed

Non-compliance register

A non-compliance register must be up to date and kept in the ECO file. The register may have the following headings:

Date of non-compliance	Responsible Contractor and person	Concise description of non-compliance	Monetary penalty (if applicable)	Remedial action given and accepted YES / NO	Remedial action completed YES / NO	Date and Signature Contractor: Remedial action completed	Date and Signature ECO: Remedial action was done satisfactorily
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5.6 Corrective Action Records

Remedial and corrective recommendations must be recorded in detail to ensure that proper guidance is given in terms of actions required. Depending on the non-compliance, this could be in the form of a step-by-step checklist to ensure ease of implementation.

The Contractor must supply a report to the ECO after completion of the remedial actions. The ECO must sign the report once satisfied that all necessary steps were taken to rectify the situation.

CHAPTER 6: PLANNING AND DESIGN PHASE

This section provides action that needs to be taken before construction of the PV facility may commence, thereby ensuring that conditions as per the EA and other environmental legislation are being met.

All the mitigation measures provided in the Environmental Impact Assessment Table for the Planning and Design Phase included as Addendum B to this EMPr must also be implemented.

6.1 Site Specific EMPr: Planning and Design Phase

This section provides actions and mitigation measures that need to be undertaken during the Planning and Design Phase as specified by the specialists which undertook impact assessment studies as part of the EIA process. Mitigation as stipulated in the engineering reports is also included hereunder. These studies are appended to the Basic Assessment Report and can be provided on request should in-depth detailed be required.

Note: The ECO is responsible for monitoring compliance to all mitigation / management actions as stated in the tables below

Protection of environmental features

Impact management outcome: Placement of permanent infrastructure to ensure protection of environmental features		
Mitigation / Management actions	Monitoring	Responsible for Implementation
<ul style="list-style-type: none"> Fauna, Flora-, Bat-, Avifauna-, Aquatic- and Heritage Impact Assessments were undertaken to determine any no-go and environmental sensitive areas as well as environmental constraints. Above-mentioned sensitivities were mapped and are presented in the Environmental Constraints Map (Chapter 2, paragraph 2.5). The final layout of the PV facility must avoid areas demarcated as having high sensitivity ratings and must be protected from development. 	<ul style="list-style-type: none"> The PV layout as approved in the EA must be strictly adhered to The EA Holder as well as the ECO must check the final design layout plans against the authorised layout 	EA Holder

Avifauna

Impact management outcome: Ensuring entrapment of birds in the perimeter fences does not lead to mortality		
Mitigation / Management actions	Monitoring	Responsible for Implementation
<ul style="list-style-type: none"> If possible, use a single perimeter fence to prevent birds from getting trapped between fences. Increase the spacing between at least the top two wires to a minimum of 30cm and ensure they are correctly tensioned. 	The EA Holder / Project Manager must ensure that the fence design is stipulated in the contract of the fencing contractor and the design must be reviewed before construction thereof commences.	EA Holder Project Manager

Visual resources

Impact management outcome: Protection of visual resources and containing the rural sense of place		
Mitigation / Management actions	Monitoring	Responsible for Implementation
<p><i>Slopes</i></p> <ul style="list-style-type: none"> Exclusion of development of steep slopes greater than 1:10m where applicable. <p><i>Trees</i></p> <ul style="list-style-type: none"> 30m buffer required between PV infrastructure and the farm roads (relevant only to the T3762 road). <p><i>Fencing</i></p> <ul style="list-style-type: none"> The PV area fencing should be placed around the development area and not extend to the road. The buffer area should be retained for agricultural land uses to reduce grass growth that could become a dry season fire risk. Fencing around the laydown and office complex areas should be simple, diamond shaped (to catch wind-blown litter) and appear transparent from a distance. The fences should be checked twice monthly for the collection of litter caught on the fence. Fencing should be located around the PV panels and appear transparent at a distance and not extended to 	The EA Holder and ECO must check that the final design adhere to these stipulations	EA Holder

<p>the road areas.</p> <p><i>Lighting</i></p> <ul style="list-style-type: none"> • Lighting needs to be restrained and should be limited to strategic nodes/ office areas. • The security fencing around the PV panels should not have security lighting. • No overhead lighting should be utilised. <p><i>Signage</i></p> <ul style="list-style-type: none"> • Signage from the roads needs to be understated 		
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Permits, plans and programmes

Impact management outcome:		
Mitigation / Management actions	Monitoring	Responsible for Implementation
<ul style="list-style-type: none"> • All permits, plans and programmes must be in place before construction commences. • Reference tables are provided in Chapter 3, paragraph 3.7. 	The ECO must keep records of all permits, plans and programmes	EA Holder

Construction workers and local communities

Impact management outcome: Ensuring good relations between the local communities and construction workers		
Mitigation / Management actions	Monitoring	Responsible for Implementation
<ul style="list-style-type: none"> • A Stakeholder Engagement Plan (SEP) and Community Health, Safety and Security Plan (CHSSP) should be prepared prior to commencement of the construction phase; • Where possible, it should be made a requirement for contractors to implement a ‘locals first’ policy for construction jobs, specifically for semi and low-skilled job categories; • The option of establishing a Monitoring Forum (MF) should be considered in order to monitor the construction phase and the implementation of the recommended mitigation measures. The MF should be established before the construction phase commences, and should include key stakeholders, including representatives from local communities, local Moqhaka Local Municipality (MLM) Councillor, farmers, and the contractor(s). The MF should also be briefed on the potential risks to the local community associated with construction 	The Plans must be kept in the ECO file and record should be kept of actions taken in relation to these plans	EA Holder Project Manager

<p>workers;</p> <ul style="list-style-type: none"> • A Code of Conduct, in consultation with representatives from the MF, should be developed for the construction phase. The Code should identify which types of behaviour and activities are not acceptable. Construction workers in breach of the code should be dismissed. All dismissals must comply with the South African labour legislation; • Contractors should be held liable for compensating farmers and communities in full for any stock losses and/or damage to farm infrastructure that can be linked to construction workers. This should be contained in the Code of Conduct to be signed between the EA Holder, the contractors, and neighbouring landowners. The agreement should also cover losses and costs associated with fires caused by construction workers or construction related activities; 		
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Employment, training and business opportunities

Impact management outcome: Creation of employment, training and business opportunities		
Mitigation / Management actions	Monitoring	Responsible for Implementation
<p>In order to enhance the positive impact of local employment and business opportunities the following measures should be implemented:</p> <p><i>Employment</i></p> <ul style="list-style-type: none"> • Where reasonable and practical, 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 from outside the area. • Where feasible, efforts should be made to employ local contractors that are compliant with Broad Based Black Economic Empowerment (BBBEE) criteria. • Before the construction phase commences the EA Holder should meet with representatives from the MLM to establish the existence of a skills database for the area. If such a database exists, it should be made available to the contractors appointed for the construction phase. • The local authorities, community representatives, and organisations on the interested and affected party database should be informed of the final decision regarding the project and the potential job opportunities for locals and the employment procedures that the proponent intends following for the construction phase of the project. • Where feasible, training and skills development programmes for locals should be initiated prior to the initiation of the construction phase. 	<p>The EA Holder and Project Manager must ensure that the contractors are aware of these stipulations</p>	<p>EA Holder Project Manager</p>

<ul style="list-style-type: none"> The recruitment selection process should seek to promote gender equality and the employment of women wherever possible. <p><i>Business</i></p> <ul style="list-style-type: none"> The proponent should liaise with the MLM 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 contractors. These companies should be notified of the tender process and invited to bid for project-related work. Where possible, the proponent should assist local BBBEE companies to complete and submit the required tender forms and associated information. The MLM, in conjunction with the local business sector and representatives from the local hospitality industry, should identify strategies aimed at maximising the potential benefits associated with the project. <p>Note that while preference to local employees and companies is recommended, it is recognised that a competitive tender process may not guarantee the employment of local labour for the construction phase.</p>		
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Battery Energy Storage Systems

Impact management outcome:		
Mitigation / Management actions	Monitoring	Responsible for Implementation
A 500m buffer surrounding all farmsteads must be maintained and no BESS is allowed within this buffer area	The final layout design must reflect this stipulation	EA Holder

6.2 General Specifications: Planning and Design Phase

This section provides general actions and mitigation measures that should be followed before construction of the solar PV facility may commence.

Note: The ECO is responsible for monitoring compliance to all mitigation / management actions as stated in the tables below

Community communication

Impact management outcome: Ensuring effective communication with surrounding landowners and communities		
Mitigation / Management actions	Monitoring	Responsible for Implementation
<ul style="list-style-type: none"> The IAP Register must be kept in the ECO file and must be updated as and when required Contact details of the EA Holder, Project Manager and ECO must be made available upon request to any IAP 	The ECO file will form part of the auditing process	ECO

Environmental awareness training

Impact management outcome: Environmental awareness training to ensure environment is treated with respect and is protected		
Mitigation / Management actions	Monitoring	Responsible for Implementation
<ul style="list-style-type: none"> Environmental Awareness Training must be given to each person (Contractor, Supervisor, Site Manager, Workers, etc.) before they may commence with any construction activities The Contractor must erect and maintain information posters / signs at key locations on site, which could include the following information as a minimum: <ul style="list-style-type: none"> Safety notifications No littering as well as the amount of fines that will be issued for littering Designated eating and smoking areas 	The ECO must keep records of the contractors on site and attendance registers must be completed for every training session and must be kept in the ECO file	EA Holder Contractor Contractor may ask ECO for assistance

Appointment of contractors

Impact management outcome: Contractors must follow stipulations as per the EMPr		
Mitigation / Management actions	Monitoring	Responsible for Implementation
<ul style="list-style-type: none"> Environmental clauses as referred to in this EMP, should be included in contract documents of all contractors. The appointment of contractors with proven track records of sound environmental performance should be given priority. All recommendations in the EMP are binding on all contractors, labourers and personnel on site. 	The contracts will be compiled by the legal team as appointed by the EA Holder	EA Holder

Site establishment

Impact management outcome: Site establishment: ensuring impact to the environment is kept to a minimum and that the development footprint is minimise		
Mitigation / Management actions	Monitoring	Responsible for Implementation
<ul style="list-style-type: none"> A method statement must be provided by the contractor prior to any onsite activity that includes the layout of the construction camp in the form of a plan showing the location of key infrastructure and services, including but not limited to offices, overnight vehicle parking areas, stores, the workshop, stockpile and lay down areas, hazardous materials storage areas (including fuels), the batching plant, designated access routes, equipment cleaning areas and the placement of staff accommodation, ablution facilities, waste and wastewater management; The construction site and laydown area must be fenced in. 	The layout plans must be approved by the ECO and Project Manager before the commencement of any onsite activity.	Contractor Project Manager

Emergency Preparedness / Response Plan

Impact management outcome: Emergency procedures are in place to enable a rapid and effective response to all types of environmental emergencies		
Mitigation / Management actions	Monitoring	Responsible for Implementation
Details of the Emergency Preparedness Plan is provided under Section 4.6 of this EMPr	<ul style="list-style-type: none"> Training to be provided by the Contractor / ECO Records of all incidents must be recorded and included 	EA Holder Contractor ECO

	in the ECO file	
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Fence design

Impact management outcome: To ensure that small animals can utilise the area without getting stuck in the perimeter fence

Mitigation / Management actions	Monitoring	Responsible for Implementation
Small ground level openings in the fence, 20-30 cm in height should be made at regular intervals to ensure that small mammals and reptiles can move through the site.	The fence design should be approved before construction thereof commences	EA Holder

CHAPTER 7: CONSTRUCTION PHASE

Actions that are required during the construction phase to ensure that the management outcomes are achieved are provided in this section of the EMPr. Actions / mitigation that are generally applicable to the construction of a solar PV facility is provided as well as site specific mitigation measures as provided by the specialists and engineers during the Basic Environmental Impact Assessment process. Any further actions as stipulated in the EA must also be included under this section.

All the mitigation measures provided for the Construction Phase in the Environmental Impact Assessment Table included as Addendum B to this EMPr must also be implemented.

It is important to note that the first stage in the construction process would be to construct the perimeter fence and internal road network to ensure that the footprint of the development does not spread outside of the boundaries of the Vlakfontein Solar PV1 facility.

7.1 Site Specific EMPr: Construction Phase

This section provides actions and mitigation measures that need to be undertaken during the construction phase as specified by the specialists which undertook impact assessment studies as part of the EIA process. Mitigation as stipulated in the engineering reports is also included hereunder. These studies are appended to the Basic Assessment Report and can be provided on request should in-depth detailed be required.

Note that the mitigation as provided by the specialists may overlap, but not conflict, with the proposed general mitigation provided under paragraph 7.2 below, but both are given to ensure clarity.

Note: The ECO is responsible for monitoring compliance to all mitigation / management actions as stated in the tables below

Fauna and flora

Impact management outcome: To ensure the protection of fauna & flora during site clearance		
Mitigation / Management actions	Monitoring	Responsible for Implementation
<i>Site clearing and preparation</i>	Monitoring for damage to	

<ul style="list-style-type: none"> • The entire area to be developed must be clearly demarcated prior to initial site clearance and construction personnel should be prevented from leaving the demarcated area; • All areas to be protected as per the Environmental Sensitivities Map must be pegged out to ensure that it is clearly identified as a No Go area. • To minimise the effect on the vegetation, insects, small mammals, and environment it is recommended that the construction be done within the winter period as far as possible, when most plants are dormant and animals less active; • Where vegetation of areas not to be developed needs to be “opened” to gain access it is recommended that the herbaceous species are cut short rather than removing them; • Vegetation clearance should be restricted to the approved development areas, allowing remaining animals the opportunity to move away from the disturbance; • Any disturbed or eroded areas within the site should be appropriately revegetated. <p><i>Loss of Fauna & Flora</i></p> <ul style="list-style-type: none"> • All temporary stockpile areas, litter and dumped material and rubble must be removed and disposed of at a licensed land fill facility. Proof of safe disposal must be obtained and kept on record for monitoring purposes; • The careful position of soil piles, and runoff control, during all phases of development, and planting of some vegetative cover after completion (indigenous groundcover, grasses etc.) will limit the extent of erosion occurring on the site; • Undeveloped areas that were degraded due to human activities must be rehabilitated using indigenous to the area vegetation; • Hazardous chemicals must be stored on an impervious surface accompanied by Safety Data Sheets (SDS) and protected from the elements. These chemicals must be strictly controlled, and records kept of when it was used and by whom; • Limit human activity in the no-developed areas as well as the completed areas to the minimum required for ongoing operation; • Alien plants should be removed as soon as possible in accordance with the Alien Invasive Management Plan 	<p>the environment as well as establishment of alien plant species must be conducted</p>	
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Avifauna

<p>Impact management outcome: To minimise displacement of priority species due to disturbance and habitat destruction</p>		
<p>Mitigation / Management actions</p>	<p>Monitoring</p>	<p>Responsible for</p>

		Implementation
<ul style="list-style-type: none"> • Construction activity should be restricted to the immediate footprint of the infrastructure; • Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of priority species; • Measures to control noise and dust should be applied according to current best practice in the industry; • Maximum use should be made of existing access roads and the construction of new roads should be kept to a minimum; • The mitigation measures proposed by the vegetation specialist must be strictly enforced; • Off-road driving is not allowed; • Rehabilitation of vegetation must take place under the guidance of a vegetation specialist after the conclusion of the construction phase. 	<ul style="list-style-type: none"> • Include importance of avifauna protection in environmental awareness training • A specialist must be appointed to compile a vegetation rehabilitation plan 	

Bats

Impact management outcome: Protection of bat roosts and foraging habitat		
Mitigation / Management actions	Monitoring	Responsible for Implementation
<ul style="list-style-type: none"> • All high sensitivity areas must be excluded from the development footprint area – implementation of the Combined Environmental Sensitivity Plan (Addendum A(b) of this EMP) must take place. • Light pollution should be minimised throughout the development footprint. • Consideration should be given to burying power lines and other infrastructure where possible – provided this will not cause disturbance of streams, wetlands, and/or indigenous trees (if/where these occur). 	The ECO should ensure that indigenous trees be kept as far as possible	ECO

Freshwater features

Impact management outcome: Protection of freshwater features		
Mitigation / Management actions	Monitoring	Responsible for Implementation
<ul style="list-style-type: none"> • Site management must be undertaken at the laydown and construction sites. This should specifically address on-site storm water management and prevention of pollution measures from any potential pollution source during construction activities such as hydrocarbon spills. 	The Storm Water Management Plan must be enforced at all times	Project Engineer

<ul style="list-style-type: none"> Any storm water that does arise within the construction sites must be handled appropriately to trap sediments and reduce flow velocities. Given the limited water availability in the area, it is advised that water be obtained off-site for construction. In order to prevent structural failure during the operational phase of the project (with subsequent risk to pollution of ground and surface water), the Project Engineer must inspect the foundation bedding of the pipelines (if applicable) before the pipes may be placed. 		
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Cultural landscape, archaeological and paleontological resources

Impact management outcome: Protection of heritage resources

Mitigation / Management actions	Monitoring	Responsible for Implementation
<p><i>Cultural landscape</i></p> <ul style="list-style-type: none"> Retain the tree avenues located along roads, access routes and farm boundaries where possible. Mitigation measures included in the VIA and HIA must be implemented. <p><i>Archaeology</i></p> <ul style="list-style-type: none"> Should any buried archaeological resources or burials be uncovered during the course of development activities, work must cease in the vicinity of these finds. The South African Heritage Resources Agency (SAHRA) must be contacted immediately in order to determine an appropriate way forward. <p><i>Palaeontology</i></p> <p>The Chance Fossil Finds procedure as described below must be implemented during the course of construction activities. The following procedure is only required if fossils are seen on the surface and when drilling/excavations commence:</p> <ol style="list-style-type: none"> When excavations begin the rocks must be given a cursory inspection by the ECO or designated person. Any fossiliferous material (plants, insects, bone, coal) should be put aside in a suitably protected place. This way the project activities will not be interrupted. Photographs of similar fossils must be provided to the developer to assist in recognizing the fossil plants, vertebrates, invertebrates or trace fossils in the shales and mudstones. This information will be built into the EMP's training and awareness plan and procedures. Photographs of the putative fossils can be sent to the palaeontologist for a preliminary assessment. If there is any possible fossil material found by the developer/environmental officer then the qualified palaeontologist sub-contracted for this project, should visit the site to inspect the selected material and check 	<p>Site clearance and excavations should be overseen by the ECO</p>	<p>Contractor Project Manager</p>

<p>the dumps where feasible.</p> <p>5. Fossil plants or vertebrates that are considered to be of good quality or scientific interest by the palaeontologist must be removed, catalogued and housed in a suitable institution where they can be made available for further study. Before the fossils are removed from the site a SAHRA permit must be obtained. Annual reports must be submitted to SAHRA as required by the relevant permits.</p> <p>6. If no good fossil material is recovered then no site inspections by the palaeontologist will be necessary. A final report by the palaeontologist must be sent to SAHRA once the project has been completed and only if there are fossils.</p> <p>7. If no fossils are found and the excavations have finished then no further monitoring is required.</p>		
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Visual resources

Impact management outcome: Containing the rural sense of place		
Mitigation / Management actions	Monitoring	Responsible for Implementation
<p><i>Paint</i></p> <ul style="list-style-type: none"> The buildings should be painted a grey-brown colour. <p><i>Dust</i></p> <ul style="list-style-type: none"> Following the removal of the vegetation, windblown dust during construction should be monitored by the ECO to ensure that it does not become a nuisance factor to the local receptors. Should excessive dust be generated from the movement of vehicles on the roads such that the dust becomes visible to the immediate surrounds, dust-retardant measures should be implemented under direction from the ECO. 	<ul style="list-style-type: none"> Lighting must be checked and tested at night – ensure that lights do not impact on night visibility whilst driving Samples of paint colour should be painted for testing purposes before bulk paint is being purchased 	Project Manager

Construction workers and local communities

Impact management outcome: Ensuring good relations between the local communities and construction workers		
Mitigation / Management actions	Monitoring	Responsible for Implementation
<ul style="list-style-type: none"> The proponent and the contractor should implement an HIV/AIDS awareness programme for all construction 	<ul style="list-style-type: none"> Attendance registers of 	Contractor

<p>workers at the outset of the construction phase;</p> <ul style="list-style-type: none"> • The construction area should be fenced off before construction commences and no workers should be permitted to leave the fenced off area during working hours; • The contractor should, as far as possible, provide transport for workers to and from the site on a daily basis. This will enable the contractor to effectively manage and monitor the movement of construction workers on and off the site; • Where necessary, the contractors should make the necessary arrangements to enable low and semi-skilled workers from outside the area to return home over weekends and/ or on a regular basis. This would reduce the risk posed to local family structures and social networks; • The contractor must ensure that all construction workers from outside the area are transported back to their place of residence within 2 days of their contract coming to an end; • It is recommended that no construction workers, with the exception of security personnel, should be permitted to overnight on the site. 	<p>training should be kept in the ECO file</p> <ul style="list-style-type: none"> • The Contractor and ECO must liaise regarding the transport of workers and the number of workers staying on site 	
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Influx of job seekers

Impact management outcome:		
Mitigation / Management actions	Monitoring	Responsible for Implementation
<p>It is impossible to stop people from coming to the area in search of a job. However, the EA Holder / Contractor should ensure that the employment criteria favour local residents in the area. In addition:</p> <ul style="list-style-type: none"> • The option of establishing a MF to monitor and identify potential problems that may arise due to the influx of job seekers to the area should be investigated. The MF should also include the other proponents of solar energy projects in the area; • A “locals first” policy should be implemented, specifically with regard to unskilled and low skilled opportunities; • A policy that no employment will be available at the gate should be implemented. 	<p>The ECO must check the recruitment policy of the Contractor and ensure that the policy is in line with these stipulations</p>	<p>EA Holder Contractor</p>

Risk to safety, livestock, and farm infrastructure

Impact management outcome: Ensuring the safety and protection of livestock and existing farm infrastructure		
Mitigation / Management actions	Monitoring	Responsible for

		Implementation
<ul style="list-style-type: none"> • An agreement between the EA Holder and local farmers in the area should be entered into whereby damages to farm property etc. during the construction phase will be compensated for. The agreement should be signed before the construction phase commences; • Traffic and activities should be strictly contained within designated areas; • Strict traffic speed limits must be enforced; • All farm gates must be closed after passing through; • Contractors should, as far as possible, provide daily transport for low and semi-skilled workers to and from the site. This would reduce the potential risk of trespassing on the remainder of the farm and adjacent properties; • Contractors should be held liable for compensating farmers and communities in full for any stock losses and/or damage to farm infrastructure that can be linked to construction workers. This should be contained in the Code of Conduct to be signed between the EA Holder, the contractors, and neighbouring landowners. The agreement should also cover losses and costs associated with fires caused by construction workers or construction related activities; • Procedures for managing and storing waste on site, specifically plastic waste that poses a threat to livestock if ingested, must be strictly enforced; • Contractors must ensure that all workers are informed at the outset of the construction phase of the conditions contained on the Code of Conduct, specifically consequences of stock theft and trespassing on adjacent farms; • Contractors must ensure that construction workers who are found guilty of stealing livestock and/or damaging farm infrastructure are dismissed and charged. This should be contained in the Code of Conduct. All dismissals must be in accordance with South African labour legislation; • It is recommended that no construction workers, with the exception of security personnel, should be permitted to stay overnight on the site. 	<p>The ECO must undertake daily site inspections and must keep records of any complaints and corrective actions taken. These records must all be included in the ECO file.</p>	<p>EA Holder Contractor</p>

Grass fires

Impact management outcome:		
Mitigation / Management actions	Monitoring	Responsible for Implementation
<ul style="list-style-type: none"> • The option of constructing a firebreak around the perimeter of the site prior to the commencement of the construction phase should be investigated; 	<ul style="list-style-type: none"> • The ECO must ensure that the agreements 	<p>EA Holder Contractor</p>

<ul style="list-style-type: none"> • The EA Holder should enter into an agreement with the local farmers in the area whereby damages to farm property etc., during the construction phase will be compensated for. The agreement should be signed before the construction phase commences; • The contractor should ensure that open fires on the site for cooking or heating are not allowed except in designated areas; • Smoking on site should be confined to designated areas; • Contractor to ensure that construction related activities that pose a potential fire risk, such as welding, are effectively managed and are confined to areas where the risk of fires has been reduced. Measures to reduce the risk of fires include avoiding working in high wind conditions when the risk of fires is greater. In this regard special care should be taken during the high risk dry, windy winter months; • Contractor should provide adequate fire-fighting equipment on-site, including a fire fighting vehicle; • Contractor to provide fire-fighting training to selected construction staff. No construction staff, with the exception of security staff, to be accommodated on site overnight; • As per the conditions of the Code of Conduct, in the advent of a fire being caused by construction workers and or construction activities, the appointed contractors must compensate farmers for any damage caused to their farms. The contractor should also compensate the fire-fighting costs borne by farmers and local authorities. 	<p>between the EA Holder and farmers are in place</p> <ul style="list-style-type: none"> • The ECO must ensure that proper signage is clearly visible at all times within the fenced area 	
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Heavy vehicles (obstruction, dust, noise)

Impact management outcome: Ensuring that heavy vehicles does not impact on the surrounding community		
Mitigation / Management actions	Monitoring	Responsible for Implementation
<p>The potential impacts associated with heavy vehicles can be effectively mitigated:</p> <ul style="list-style-type: none"> • The movement of heavy vehicles associated with the construction phase should be timed to avoid times of the week, such as weekends, when the volume of traffic travelling along the local roads in the area may be higher; • Damage to the Viljoenskroon Road, S642 and Vermaasdrift Road, and other local farm roads that may be impacted, should be repaired throughout the construction period; • Construction related activities and movement of traffic should ensure that access to silos at Vierfontein and Viljoenskroon, specifically during harvesting period of May to July, is not impaired; • Construction operations should be planned to minimise the total area cleared at any given time; • Construction operations that have the potential to generate significant dust impacts, such as site clearance etc, should be timed to avoid harvesting times; • Cleared areas should be rehabilitated once the construction phase has been completed; 	<p>All complaints, and actions taken, should be recorded in the Complaints Register and kept in the ECO file</p>	<p>EA Holder Project Manager Project Engineer Contractor</p>

<ul style="list-style-type: none"> • Dust suppression measures must be implemented on un-surfaced roads, such as wetting on a regular basis and ensuring that vehicles used to transport sand and building materials are fitted with tarpaulins or covers; • All vehicles must be road-worthy, and drivers must be qualified and made aware of the potential road safety issues and need for strict speed limits. 		
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Traffic

Impact management outcome: Prevent traffic congestion and delays on the surrounding road

Mitigation / Management actions	Monitoring	Responsible for Implementation
<p><i>General</i></p> <ul style="list-style-type: none"> • Stagger component delivery to site. • Reduce the construction period. • The use of mobile batch plants and quarries in close proximity to the site, if available and feasible should be considered. • Staff and general trips should occur outside of peak traffic periods. • Consider scheduling shift changes to occur outside peak hours to concentrate staff trips in off peak periods. • Regular maintenance of gravel roads by the Contractor during the entire construction phase is required. • Dust suppression of gravel roads during the construction phase, should be applied as and when required. • The TMP should be updated when changes are made to the project that will affect the traffic on the surrounding road network and the transportation requirements of the project. • A designated personnel member of the Contractor’s team must be the custodian of the plan and the custodian must ensure that all personnel and subcontractors are trained to ensure compliance. • The requirements of the TMP shall apply to all construction personnel and subcontractors appointed to provide vehicles, machinery or drivers. • The Contractor is expected to review the TMP every four months or immediately after an incident, when corrective measures will be incorporated into the Plan. <p><i>Accommodation of Traffic</i></p> <ul style="list-style-type: none"> • The Contractor is to submit a detailed Traffic Accommodation Plan to the Project Engineer for approval, for all access roads. • Specifications must be strictly in accordance with the South African Road Traffic Signs Manual and in accordance with the relevant specifications of the project documents. 	<ul style="list-style-type: none"> • Monthly monitoring of the road surface • Incidents and non-compliance to be reported by the ECO 	<p>EA Holder Project Manager Project Engineer Contractor</p>

- The Contractor must ensure that provision is made for access by emergency vehicles, where required.

Emergency Preparedness and Incident Management

- Local emergency services shall be consulted prior to the start of the project to ascertain the availability and capacity of emergency services to attend to road and construction accidents associated with the Project.
- All hazards shall immediately be reported to the Site Manager who shall take the appropriate measures to avoid the occurrence of an incident or accident.
- Relevant staff shall be required to undertake first aid training and all project vehicles shall carry first aid supplies which should be adequate to cater for the number of passengers carried on the vehicle in question.
- An on-site emergency procedure shall be made available and implemented when an incident occurs.
- If an accident occurs off-site, it shall immediately be reported to the relevant emergency services.
- Records of all accidents, incidents and near misses shall be kept on site and mitigation measures shall be investigated.

Transport Coordinator

- It is recommended that a transport coordinator (or similar designation) be appointed to ensure compliance of the TMP. The coordinator shall make all the necessary arrangements to maintain the required traffic measures for the duration of the construction period.

Licensing

- All construction vehicles shall have the necessary licences, a valid roadworthy certificate and shall comply with the relevant traffic and transport licencing requirements (such as abnormal loads or hazardous materials).
- All drivers of vehicles shall have the requisite licences to operate any vehicle (or machinery) operated by them on site or on any public roads. Drivers' licenses must be applicable to the specific vehicle/machinery that is being used.

Construction Staff

- Staff and general trips should occur outside of peak traffic periods as far as possible.
- Consider scheduling shift changes to occur outside peak hours to concentrate staff trips in off peak periods.
- All staff shall be transported safely to site in appropriate vehicles. Staff shall not be allowed to be transported to site on the back of open trucks. Passenger vehicles shall not exceed the carrying capacity of the vehicle.
- Collections/Drop-off points for staff shall be located at a safe distance from traffic and construction activities. Roads and areas used by construction vehicles shall, as far as possible be avoided by all personnel.

Designated pedestrian pathways shall be demarcated where appropriate.

- All staff shall receive the appropriate site safety induction training. Drivers shall be adequately trained in the identification and avoidance of road hazards, vehicle maintenance and care and safety requirements. All staff shall be informed of the construction site risks and training shall include appropriate precautionary measures required to be undertaken to facilitate safe and efficient traffic management (e.g., understanding signage, crossing roadways and utilising designated pedestrian pathways, reporting incidents).

Inspection of all Routes

- A “dry-run” of all routes is to be undertaken to identify any areas to avoid or obstacles that might disrupt the movement of the construction vehicles. All issues affecting the movement of construction vehicles are to be addressed immediately by the Contractor and relevant stakeholders e.g., law enforcement, relevant roads department and authorities.

Component Delivery

- The delivery of components to the site can be staggered and trips can be scheduled to occur outside of peak traffic periods.

Maintenance of vehicles

- All vehicles and construction plant shall be regularly maintained, repaired when necessary and inspected on a regular basis to ensure that the vehicles are in good working order, maintenance to take place within the site camp, with an appropriate drip tray. Construction and passenger vehicles shall be monitored to ensure that vehicles are not overloaded.

Maintenance of roads

- The Contractor shall maintain the road used by construction vehicles, repairing any damage caused by construction traffic to the surrounding road network.
- Dust suppression of gravel roads during the construction phase, as required.
- Road verges at the site shall be regularly maintained to ensure that vegetation remains short and that the roads serve as an effective firebreak.
- Any internal gravel roads will require grading with a grader to obtain a flat even surface and the geometric design of these gravel roads needs to be confirmed at detailed design stage. This process is to be undertaken by a civil engineering consultant or a geometric design professional.

Signage

- Signage, in accordance with the South African Road Traffic Signs Manual (SARTSM), will be required to be conspicuously placed at appropriate locations along all access roads, the internal roads to the site and public roads used by construction vehicles (in consultation with the relevant traffic authorities) to indicate the following:
- all road and pedestrian hazards;
- site access
- site offices
- wayfinding signs on internal roads e.g. parking, toilets, emergency assembly point
- crossing points;
- speed limits;
- turning traffic;
- dedicated routes for construction vehicles and staff;
- no-go areas; and
- any traffic control information which may be relevant to the construction activity at the time.
- It is recommended that flagmen be implemented when high volumes of construction traffic are expected to help direct the traffic, thus ensuring the safe movement of the vehicles and reducing the potential conflicts.

Speed limit

- All drivers operating vehicles shall comply with the posted speed limits (or the maximum allowable speed as per the permit for abnormal load vehicles) on public roads as well as a proposed 30km/h speed limit within the construction site and access roads.
- The failure to adhere to the prescribed speed limits is an offence and disciplinary action may be taken by the Contractor.

Abnormal Loads

- Abnormal permits are required for vehicles exceeding the permissible maximum dimensions on road freight transport in terms of the Road Traffic Act (Act No. 93 of 1996).
- Abnormal Loads may be required which will necessitate an application to the Department of Transport and Public Works for a permit that will give authorisation for the conveyance of said load. A permit is required for each Province that the haulage route traverses.

Preferred Abnormal load route

<ul style="list-style-type: none"> • The preferred route should be surveyed to identify problem areas, e.g., intersections with limited turning radii and sections of the road with sharp horizontal curves or steep gradients that may require modification. • After the road modifications have been implemented, it is recommended to undertake a “dry-run” with the largest abnormal load vehicle, prior to the transportation of any components, to ensure that the delivery will occur without disruptions. This process is to be undertaken by the haulage company transporting the components and the Contractor, who will modify the road and intersections to accommodate abnormal vehicles. It needs to be ensured that gravel sections (if any) of the haulage routes remain in good condition and will need to be maintained during the additional loading of the construction phase and reinstated after construction is completed. • Any low hanging overhead lines (lower than 5.1m) e.g., Eskom and Telkom lines, along the proposed routes will have to be moved to accommodate the abnormal load vehicles. 		
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Battery Energy Storage Systems

Main processes/activities and some details of likely elements

MAIN PROCESSES	DETAILS
Construction machines e.g., cranes, graders, cement trucks, diesel and oil storage	Graders to clear ground make roads, diggers for trenches foundations, cement mixers for civil works, cranes to place containers, diesel bowser for fuel for machines, oil for machines
Materials for the construction of any buildings, e.g. at the substation Equipment items for installations within the supporting infrastructure	Building materials such as bricks, cement, re-bar, I-beams, roof sheeting etc. Electrical equipment such as transformers, pylons, cabling.
Equipment items for containerised installation e.g., lithium battery containers	Battery containers Electrical equipment such as transformers, pylons, cabling.
Waste e.g., packaging materials, paint	Connections, transformers, switches etc will likely have protective coverings (Plastic, paper, cable ties etc) to remove during installation, paint waste (cans, brushes, solvents), building rubble
Construction camp	Temporary offices, accommodation, ablutions

Receptor / Impact	Description	Preventative and Mitigation Measures
Human Health - chronic exposure to toxic chemical or biological agents	Causes - Construction materials such as cement, paints, solvents, welding fumes, truck fumes etc. Consequences - Employee / contractor illness.	<ul style="list-style-type: none"> • 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. • SHEQ policy in place. • A detailed construction risk assessment prior to work. • SHE procedure in place. • PPE to be specified. • SHE appointees in place. • Contractor's safety files in place and up to date. • All necessary health controls/ practices to be in place, e.g. ventilation of welding and painting areas. • SHE monitoring and reporting programs in place. • 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. Consequences - Adverse impact on hearing of workers. Possible nuisance factor in near-by	<ul style="list-style-type: none"> • The construction phase will be the noisy phase of the project. • No extreme construction envisaged, normal road, industrial building type construction similar to what would take place in an industrial area. • Health risk assessment to determine if equipment continuous noise exceeds 85dB at workstation and 61dB at boundary of the site • Employees to be provided with hearing protection if working near equipment that exceeds the noise limits. • Due to rural nature of site, construction is unlikely to continue after sunset.
Human Health - exposure to temperature extremes and/or humidity	Causes - Heat during the day. Cold in winter. Consequence - Heat stroke. Hypothermia.	<ul style="list-style-type: none"> • 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. • Adequate potable water to be provided during all phases of the project. Bore hole, bowser and tank or small water treatment plant may be required to provide potable water for the plants during all phases of the project.

Receptor / Impact	Description	Preventative and Mitigation Measures
Human Health - exposure to psychological stress	Causes - Large projects bring many contractor workers into a small, isolated community. Consequences – Lack of sufficient accommodation, entertainment etc. Increase in alcohol abuse, violence	<ul style="list-style-type: none"> • Depending on size of contract and scope, project may need to provide regular/periodic transport to town and nearby cities. • Local community involvement and as far as possible preferably use of local persons as contract workers on the project.
Human Health - exposure to ergonomic stress	Causes - Lifting heavy equipment. Awkward angles during construction. Consequences - Back and other injuries.	<ul style="list-style-type: none"> • Training in lifting techniques. • Ensure that despite the relatively isolated location all the necessary equipment is available (and well maintained) during construction. Otherwise, employees may revert to unsafe practices. Isolated location, maintenance of construction equipment to ensure safe operation is critical. Ensure this is in place prior to project beginning. • Development of local service providers. • First aid provision on site.
Human and Equipment Safety - exposure to fire radiation	Causes – Involvement in an external fire. Fire involving fuels used in construction vehicles or vehicles themselves (e.g., tyre fire). Fire due to uncontrolled welding or other hot-work Consequences - Injuries due to radiation especially amongst first responders and bystanders. Fatalities unlikely from the heat radiation as not highly flammable nor massive fire.	<ul style="list-style-type: none"> • Fuels stored on site in dedicated, demarcated and banded areas. • Suitable fire-fighting equipment on site near source of fuel, e.g. diesel tank, generators, mess, living quarters, workshops etc • Emergency plan to be in place prior to commencement of construction. • Fuel spill containment procedures and equipment to be in place. • Hot-work permit and management system to be in place.
Human and Equipment	Causes - Solid state battery containers damaged on route e.g.,	<ul style="list-style-type: none"> • Solid state battery design includes abuse tests such as drop test, impact, rapid discharge etc. Propagation tests for systems, e.g., heat insulating materials between cells/modules. Factory acceptance test prior to

Receptor / Impact	Description	Preventative and Mitigation Measures
<p>Safety - exposure to fire radiation</p>	<p>dropped in port (drops do happen about 1/2000 containers) and importing possibly approximately 100 containers for each BESS 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.</p> <p>Consequences – Injuries due to radiation especially amongst first responders and bystanders. Fatalities unlikely from the heat radiation as not highly flammable nor massive fire</p>	<p>prior to leaving manufacture. 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.</p> <ul style="list-style-type: none"> • The applicants should ensure suitably competent transport companies are appointed. The company responsible for transportation should ensure: <ul style="list-style-type: none"> ○ Compliance with National Road Traffic Act regulation 8 – dangerous goods. ○ 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. • Data indicates installed facility events are 0.001/year. Transport of 100 units per installation assumed to take 4 weeks each so f= 0.008 once in 125 years so likelihood is very low. • Prior to bringing any containers into the country a full Emergency response plan should be in place for the full route from the ship to the site. Drivers trained in the hazards of containerized batteries. Emergency plan to determine and address: <ul style="list-style-type: none"> ○ What gases would be released in a fire and are there inhalation hazards ○ 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 reigniting. ○ What initial fire extinguishing medium should be used? ○ Are there any secondary gases or residues from use of extinguishers? ○ If water is appropriate, may need outside connections to inside sprinklers? ○ First responders need to know what media to use, especially if water totally unsuitable and if there are no connection points for water etc. ○ Must the container be left unopened or opened? ○ PPE to be specified including possible exposure to chemicals and fumes as well as radiate heat. ○ Containment of residues/water/damaged equipment. ○ Suitable safe making a disposal plan considering after the event, how do responders deal with

Receptor / Impact	Description	Preventative and Mitigation Measures
		partially charged damage units, contaminated surfaces (e.g., HF residues).
Human and Equipment Safety - exposure to explosion over pressures	<p>Causes - With solid state lithium containers, flammable gases generated by thermal run away reach explosive limits. Ignition on hot surfaces, static.</p> <p>Consequences - Potential fatalities amongst first responders.</p> <p>Damage to container, transport truck or other nearby items, e.g., other container in the port.</p>	<ul style="list-style-type: none"> • 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. • 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. • Once an import route has been chosen, e.g. Cape Town port and up the N1 and N10 or Port of Saldanha and along the N14 etc, 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 Du Toitskloof tunnel.
Human and Equipment Safety - exposure to acute toxic chemical and biological agents	<p>Causes Human pathogens and diseases, sewage, food waste. Snakes, insects, wild and domesticated animals and harmful plants.</p> <p>Consequences - Illness and at worst without mitigation, possibly extending to fatalities.</p> <p>Effects can vary from discomfort to fatalities for venomous snakes or bee swarms etc</p>	<ul style="list-style-type: none"> • All necessary good hygiene practices to be in place, e.g. provision of toilets, eating areas, infectious disease controls. • Policies and practice for dealing with known vectors of disease such as Aids, TB, COVID 19 and others. • Prior to construction determine the dangerous species in the area and what responses are needed to bites/exposure/attacks. • 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. • 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

Receptor / Impact	Description	Preventative and Mitigation Measures
Human and Equipment Safety - exposure to acute toxic chemical and biological agents	<p>Causes - Damaged solid-state batteries release fumes, leak electrolyte, are completely broken exposing hazardous chemicals. Thermal runaway and hazardous fumes released.</p> <p>Consequences - Impacts can vary from mild skin irritation from exposure to small leaks to serious corrosive burns or lung damage.</p>	<ul style="list-style-type: none"> • 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. Prescription found in SANS 10228/29 and international codes for battery transport etc. • Transport in sealed packages that are kept upright, protected from movement damage etc. • Also packaged to ensure no short-circuiting during transport. • Transport to prevent excessive vibration considerations as battery internal may be damaged leading to thermal run-away during commissioning. • 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. • Route selection to consider possible incidents along the way and suitable response, e.g. satellite tracking, mobile communication, 24/7 helpline response. • Standard dangerous goods requirements for Hazmat labels, Trem cards, driver trained in the hazards of the load. • Likelihood similar to fire above.
Human and Equipment Safety - exposure to violent release of kinetic or potential energy	<p>Causes - Construction moving equipment, heavy loaded, elevated loads, working at heights</p> <p>Consequences - Injury or possibly fatality. Damage to equipment. Delays in starting the project, financial losses</p>	<ul style="list-style-type: none"> • 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. • SHEQ policy and SHE procedure in place. • A detailed construction risk assessment prior to work. • PPE to be specified. • SHE appointees in place. • Contractors safety files in place and up to date. • SHE monitoring and reporting programs in place. • Standard construction site rules regarding traffic, reversing sirens, rigging controls, cordoning off excavations etc. • Civil and building structures to National Building Regulations and building Standards Act 103 of 1977 SANS 10400 and other relevant codes. • Other constructions such as roads, sewers etc also to relevant SANS standards. • All normal procedures for working at heights, hot work permits, confined space entry, cordon off

Receptor / Impact	Description	Preventative and Mitigation Measures
		<p>excavations etc to be in place before construction begins.</p> <ul style="list-style-type: none"> • Emergency response plan to be in place before construction begins.
Human and Equipment Safety - exposure to electromagnetic waves	<p>Causes - Use of electrical machines, generators etc. Hot dry area static generation is highly likely. Lightning strike. Consequences - Electrocutation. Ignition and burns. Injury and death. Damage electrical equipment.</p>	<ul style="list-style-type: none"> • Standard maintenance of condition of electrical equipment and safe operating instructions. • Ability to shut off power to systems in use on site. • If persons are decanting fuels or dealing with other highly flammable materials care should be taken regarding possible static discharge, installations to be suitably designed and maintained. • Lightning strike rate in the study area is moderately high. • Outside work must be stopped during thunderstorms. • Lightning conductors may be required for the final installation, to be confirmed during design phase.
Environment - emissions to air	<p>Causes - Dust from construction and generally hot dry area. Consequences - Adverse impact on employee health.</p>	<ul style="list-style-type: none"> • May need to use dampening on roads etc. as per normal construction practices. • May need PPE (dust masks) for specific construction workers.
Environment - emissions to water	<p>Causes - Diesel for equipment, paints and solvents. Transformer oil spills. Sewage and kitchen/mess area wastewater. Consequences - Environmental damage, particularly to the surface and underground water in the area.</p>	<ul style="list-style-type: none"> • Normal construction site practices for preventing and containing fuels/paint/oil etc spills. • Bunding under any temporary tanks, curbing under truck offloading areas and sealed surfaces (e.g., concrete) under truck parking area is particularly important. • Spill clean-up procedures to be in place before commencing construction. • Sewage and any kitchen liquids - containment and suitable treatment/disposal
Environment - emissions to earth	<p>Causes - Mess area and other solid waste. Consequences - Environmental damage.</p>	<ul style="list-style-type: none"> • 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. • There will need to be waste segregation (e.g., electronic equipment, chemicals) and management on the site.

Receptor / Impact	Description	Preventative and Mitigation Measures
Environment - waste of resources e.g., water, power etc	<p>Causes - Water usage not controlled. Battery containers damaged.</p> <p>Consequences - Delays.</p>	<ul style="list-style-type: none"> • Water usage to be monitored on site during construction. • Handling protocols to be provided by battery supplier. • 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. • Water management plan and spill containment plans to be in place.
Public - Aesthetics	<p>Causes - Bright surfaces reflecting light. Tall structures in a flat area.</p> <p>Consequences - Irritation.</p>	<ul style="list-style-type: none"> • Limited height for electrical infrastructure. • Visual impact assessment to include BESS installation when design details become available. • Battery containers single storey as physical space is not a constraint that would require stacking of containers. • Containers likely to be painted white, not left as reflective steel.
Investors - Financial	<p>Causes - Defective technology. Extreme project delays.</p> <p>Consequences - Financial loss</p>	<ul style="list-style-type: none"> • Design by experienced contractors using internationally recognized and proven technology. • Project management with deviation monitoring. Project insurance for construction phase.
Employees and investors - Security	<p>Causes - On route, potential hi-jacking of valuable but hazardous load. On site, theft of construction equipment and battery installation facilities. Civil unrest or violent strike by employees.</p> <p>Consequences - Theft. Injury to burglars. Damage to equipment possibly setting off thermal runaway.</p>	<ul style="list-style-type: none"> • Fencing around electrical infrastructure to SANS standard and Eskom Guidelines. • The hazardous nature of the electrical and battery equipment should be clearly indicated – e.g., Skull and Cross Bones or other signs. • Isolated location both helps and hinders security. • Night lighting to be provided both indoors and outdoors where necessary.

Receptor / Impact	Description	Preventative and Mitigation Measures
Emergencies	<p>Causes - Fires, explosions, toxic smoke, large spills, traffic accidents, equipment/structural collapse.</p> <p>Inadequate emergency response to small event leads to escalation.</p> <p>Consequences - Injuries turn to fatalities, small losses become extended down time.</p>	<ul style="list-style-type: none"> • All safety measures listed above. • Small events not handled correctly and escalate into larger events. • Emergency procedures need to be practiced prior to commencement of construction. • 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. • 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 runaway event on a truck with a container that stops in a small town for driver refreshments
Investors - Legal	<p>Causes Battery field is evolving quickly with new guides, codes and regulations happening at the same time as evolving technology.</p> <p>Consequences - Unknown hazards manifest due to using "cheaper supplier or less developed technology".</p>	<ul style="list-style-type: none"> • Use only internationally reputable battery suppliers who comply with all known regulations/guideline at the time of purchasing. • Ensure only latest state of the art battery system are used.

7.2 General Specifications: Construction Phase

This section provides general actions and mitigation measures that should be followed during the construction phase of this project.

Note: The ECO is responsible for monitoring compliance to all mitigation / management actions as stated in the tables below

Demarcation of no-go areas

Impact management outcome: Protection of ecological sensitive areas as well as areas outside of the development site		
Mitigation / Management actions	Monitoring	Responsible for Implementation
<ul style="list-style-type: none"> Ecologically sensitive areas as identified during the EIA process must be demarcated and treated as No-Go areas; All areas outside of the designated construction footprint shall be declared a No-Go area; No equipment shall be allowed outside the site and defined access routes, or within No-Go areas, unless expressly permitted by the ECO; The ECO and Project Manager must establish a penalty system to manage any non-compliance. 	The ECO must keep record of any non-compliance	EA Holder Contractor

Vegetation clearing

Impact management outcome: Vegetation clearing is restricted to the authorised development footprint		
Mitigation / Management actions	Monitoring	Responsible for Implementation
<ul style="list-style-type: none"> Indigenous vegetation which does not interfere with the development must be left undisturbed; Special care should be taken not to damage protected or endangered species; Where applicable, search, rescue and replanting of all protected and endangered species likely to be damaged during project development must be identified by the relevant specialist and completed prior to any development or clearing; Where applicable, permits for removal must be obtained from the relevant authority prior to the cutting or clearing of the affected species; Where applicable, the Environmental Audit Report must confirm that all identified species have been rescued and replanted and that the location of replanting is compliant with conditions of approvals; Rivers and watercourses must be kept clear of felled trees, vegetation cuttings and debris; Herbicides <ul style="list-style-type: none"> Only a registered pest control operator may apply herbicides on a commercial A daily register must be kept of all relevant details of herbicide usage; No herbicides must be used in any watercourse; All protected species and sensitive vegetation not removed must be clearly marked and such areas cordoned/fenced off; 	The ECO must be permanently on site and must undertake daily site inspections where clearing is taking place	Contractor

<ul style="list-style-type: none"> • Alien invasive vegetation must be removed and disposed of at a licensed waste management facility. 		
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Protection of fauna and livestock

Impact management outcome: Disturbance to fauna is minimised		
Mitigation / Management actions	Monitoring	Responsible for Implementation
<ul style="list-style-type: none"> • No interference with livestock must occur without the landowner’s written consent and with the landowner or a person representing the landowner being present; • Breeding sites must be kept intact and disturbance to breeding birds must be avoided. Special care must be taken where nestlings or fledglings are present; • No poaching must be tolerated under any circumstances. All animal dens in close proximity to the works areas must be marked as Access restricted areas; • No deliberate or intentional killing of fauna is allowed. 	<ul style="list-style-type: none"> • The ECO must ensure that all sensitive areas are demarcated • Protection of fauna must be part of the environmental awareness training 	Contractor

Responsible water usage

Impact management outcome: Undertake responsible water usage		
Mitigation / Management actions	Monitoring	Responsible for Implementation
<ul style="list-style-type: none"> • All abstraction points or bore holes must be registered with the DWS and suitable water meters installed to ensure that the abstracted volumes are measured to ensure that abstraction stays within the allowable limits as per the Water Use License; • Ensure water conservation is being practiced by: <ul style="list-style-type: none"> ○ Minimising water use during cleaning of equipment; ○ Undertaking regular audits of water systems; ○ Including a discussion on water usage and conservation during environmental awareness training; and ○ The use of grey water is encouraged. 	<ul style="list-style-type: none"> • Abstraction volumes must be recorded and included in the ECO file • Training material must be approved by the ECO 	EA Holder Contractor

Protection of watercourses

Impact management outcome: Pollution and contamination of the watercourse environment and or estuary erosion are prevented		
Mitigation / Management actions	Monitoring	Responsible for Implementation
<ul style="list-style-type: none"> • All watercourses must be protected from direct or indirect spills of pollutants such as solid waste, sewage, cement, oils, fuels, chemicals, aggregate tailings, wash and contaminated water or organic material resulting from construction activities. • In the event of a spill, prompt action must be taken to clear the polluted or affected areas; • No equipment must traverse any seasonal or permanent wetland unless specifically approved by the Project Engineer and ECO; • Development of permanent watercourse crossings must only be undertaken where no alternative access is available; • There must not be any impact on the long term morphological dynamics of watercourses; • Existing crossing points must be favoured over the creation of new crossings (including temporary access) • When working in or near any watercourse, the following environmental controls and consideration must be taken: <ul style="list-style-type: none"> • Water levels during the period of construction; • No altering of the bed, banks, course or characteristics of a watercourse • 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; • Where earthwork is being undertaken in close proximity to any watercourse, slopes must be stabilised using suitable materials, i.e. sandbags or geotextile fabric, to prevent sand and rock from entering the watercourse; and • Appropriate rehabilitation and re-vegetation measures for the watercourse banks must be implemented timeously. In this regard, the banks should be appropriately and incrementally stabilised as soon as development allows. 	<ul style="list-style-type: none"> • Watercourses must be demarcated before construction commences • The environmental awareness training must include a section that focusses on the importance of protection of our watercourses • Weekly inspection of demarcated areas must take place and corrective action where required. 	Contractor Project Engineer

Risk of groundwater pollution (oil spills and storm water)

Impact management outcome: Protection of soil, ground- and surface water		
Mitigation / Management actions	Monitoring	Responsible for Implementation
<ul style="list-style-type: none"> • A bio-remediation contractor must be appointed to rehabilitate large oil spills. The regional officer of the Department of Water and Sanitation will advise in this regard and they must be notified within 24 hours about any incidents during construction or operations that may impact on water resources; • Small oil spills must be cleaned immediately with an oil spill kit that must at all times be available on site; • Storm water should not be discharged into the working areas and it should be ensured that storm water leaving the footprint of the proposed development areas is not contaminated by any substance, whether that substance is solid, liquid, vapour or any combination thereof; • Under no circumstances is contaminated water allowed to be released onto the land or any watercourse area; • Construction vehicles may only be serviced in a bunded area. • In order to prevent structural failure during the operational phase of the project (with subsequent risk to pollution of ground and surface water), the Project Engineer must inspect the foundation bedding of the pipelines before the pipes may be placed. 	<p>Procedures for pro-active measures as well as incident reporting and corrective action during spillages and emergency situations should be followed at all times</p>	<p>Contractor Project Engineer</p>

Storm and waste water management

Impact management outcome: Impacts to the environment caused by storm water and wastewater discharges during construction are avoided		
Mitigation / Management actions	Monitoring	Responsible for Implementation
<ul style="list-style-type: none"> • The stipulations as per the Storm Water Management Plan (SWMP) compiled for this project must be followed at all times; • Runoff from the cement/ concrete batching areas must be strictly controlled, and contaminated water must be collected, stored and either treated or disposed of off-site, at a location approved by the Project Manager; • All spillage of oil onto concrete surfaces must be controlled by the use of an approved absorbent material and the used absorbent material disposed of at an appropriate waste disposal facility; • Natural storm water runoff not contaminated during the development and clean water can be discharged directly to watercourses and water bodies, subject to the Project Manager's approval and support by the ECO; • Under no circumstances is contaminated water allowed to be released onto the land or any watercourse area; • Water that has been contaminated with suspended solids, such as soils and silt, may be released into 	<p>Regular site inspections must be undertaken, especially during and after rain and storm events</p>	<p>Project Manager Project Engineer</p>

watercourses or water bodies only once all suspended solids have been removed from the water by settling out these solids in settlement ponds. The release of settled water back into the environment must be subject to the Project Manager's approval and supported by the ECO.

Protection of heritage resources

Impact management outcome: Impact to heritage resources is minimised

Mitigation / Management actions	Monitoring	Responsible for Implementation
<ul style="list-style-type: none"> Identify, demarcate and prevent impact to all known sensitive heritage features on site; Carry out general monitoring of excavations for potential fossils, artefacts and material of heritage importance; All work must cease immediately if any human remains and/or other archaeological, palaeontological and historical material are uncovered. Such material, if exposed, must be reported to the nearest museum, archaeologist/ palaeontologist, so that a systematic and professional investigation can be undertaken. Sufficient time must be allowed to remove/collect such material before development recommences. 	<ul style="list-style-type: none"> The ECO must ensure that all known heritage resources are demarcated Protection of heritage resources must be part of the environmental awareness training 	Contractor

Construction site

Impact management outcome:

Mitigation / Management actions	Monitoring	Responsible for Implementation
<ul style="list-style-type: none"> The construction site offices and storage areas for material and equipment must be kept inside the development area to prevent impacts and human interference to spread further than the site; Storage facilities for construction equipment must be provided for; Accommodation for labourers must be limited, as far as possible, to guarding personnel on the construction site (with labourers transported to and from the site); Sufficient ablution must be provided at the construction site; On-site storage of petroleum products for construction purposes should be kept to the absolute minimum; Strict clean up requirements of the site camp is required (waste concrete, reinforcing rods, waste bags, wire, timber etc.) and disposal at a municipal waste disposal site must be done regularly; The contractor shall establish a sufficient recess area within the construction camp; 	Twice weekly (or more if possible) inspections of the laydown areas, construction camp and areas where construction activities are taking place must be undertaken.	Contractor

<ul style="list-style-type: none"> • The recess area should include a food preparation area with adequate washing facilities and bins; • The Contractor and ECO shall ensure that the recess area and ablution facilities are positioned so as to limit visual intrusion on neighbours or the greater environment; • No littering may take place. 		
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Sanitation

Impact management outcome: Clean and well maintained toilet facilities are available to all staff in an effort to minimise the risk of disease and impact to the environment		
Mitigation / Management actions	Monitoring	Responsible for Implementation
<ul style="list-style-type: none"> • Mobile chemical toilets must be installed onsite if no other ablution facilities are available; • Ablution facilities and or mobile toilets must be used at all times and no indiscriminate use of the veld for the purposes of ablutions must be permitted under any circumstances; • Where mobile chemical toilets are required, the following must be ensured: <ul style="list-style-type: none"> ○ Toilets are located no closer than 100m to any watercourse or water body; ○ Toilets are secured to the ground to prevent them from toppling due to wind or any other cause; ○ No spillage occurs when the toilets are cleaned or emptied; ○ Toilets have an external closing mechanism and are closed and secured from the outside when not in use to prevent toilet paper from being blown out; ○ Toilets are emptied before long weekends and workers holidays, and must be locked after working hours; 	<ul style="list-style-type: none"> • Toilets are serviced regularly and the ECO must inspect toilets to ensure compliance to health standards; • A copy of the waste disposal certificates must be maintained. 	Contractor

Waste Management

Impact management outcome: Wastes are appropriately stored, handled and safely disposed of at a recognised waste facility		
Mitigation / Management actions	Monitoring	Responsible for Implementation
<p><i>Waste minimisation</i></p> <ul style="list-style-type: none"> • Materials should be ordered shortly prior to use to avoid deterioration / breakage during storage; • Materials should be ordered in bulk to reduce packaging but without over-ordering resulting in waste generation; • Construction site staff must be trained to load and unload materials correctly to avoid breakage and wastage; • Materials must be stored appropriately according to the supplier's specifications to reduce the risk of damage or deterioration; 	<ul style="list-style-type: none"> • Waste registers must be maintained and kept in the ECO file • Certificates of safe disposal for general, hazardous and recycled 	Contractor

<ul style="list-style-type: none"> • Any over-run or off-cut materials should be either re-used on site, re-used in another construction operation or recycled; • Where possible, all oils and greases must be retained for recycling. <p><i>Construction waste</i></p> <ul style="list-style-type: none"> • Compliance with stringent daily clean up requirements of site camp inert waste (waste concrete, reinforcing rods, wire, timber, etc.) and disposal at municipal waste disposal sites must take place; • Construction waste must be collected and sold for recycling purposes. <p><i>General</i></p> <ul style="list-style-type: none"> • A housekeeping team should be appointed to regularly maintain the litter and rubble situation on the construction site; • Skip waste containers should be maintained on site. These should be kept covered and arrangements made for them to be collected regularly to prevent vermin and odours; • All measures regarding waste management must be undertaken using an integrated waste management approach; • Scavenger and weatherproof bins must be provided; • A suitably positioned and clearly demarcated waste collection site must be identified and provided; • The waste collection site must be maintained in a clean and orderly manner; • Waste must be segregated into separate bins and clearly marked for each waste type for recycling and safe disposal; • Staff must be trained in waste segregation; • Bins must be emptied regularly; • General waste produced onsite must be disposed of at registered waste disposal sites/ recycling company. <p><i>Hazardous Waste</i></p> <ul style="list-style-type: none"> • Oil contaminated waste (soil, cloths used to clean small spills, spill kits, content of drip trays, etc.) must be disposed of at a facility that is registered as a hazardous landfill facility; • All hazardous substances at the site must be adequately stored and accurately identified, recorded and labelled; • Hydrocarbon (oil, diesel, petrol) waste as well as hydrocarbon containing material must be regarded as hazardous waste and separated from general waste; • Persons who remove hazardous waste must be appropriately qualified and authorized. 	<p>waste must be maintained</p>	
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Hazardous substances and storage areas

Impact management outcome: Safe storage, handling, use and disposal of hazardous substances		
Mitigation / Management actions	Monitoring	Responsible for Implementation
<ul style="list-style-type: none"> • The use and storage of hazardous substances to be minimised and non-hazardous and non-toxic alternatives substituted where possible; • No hazardous waste may be buried or burned under any circumstances; • All hazardous chemicals that will be used on site must have Material Safety Data Sheets (MSDS); • All hazardous substances must be stored in suitable containers as defined in the Method Statement; • Containers must be clearly marked to indicate contents, quantities and safety requirements; • Containers that contained toxic or harmful materials shall not be rinsed and re-used; • Such containers shall not be stored or disposed on site. These containers shall be destroyed to prevent re-use and disposed in accordance with the manufacturer’s instructions at a permitted waste facility with a waste slip obtained and saved within the Environmental file; • An Alphabetical Hazardous Chemical Substance (HCS) control sheet must be drawn up and kept up to date on a continuous basis; • All employees working with HCS must be trained in the safe use of the substance and according to the safety data sheet; • 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; • Where refueling away from the dedicated refueling station is required, a mobile refueling unit and appropriate ground protection such as drip trays must be used; • 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; • The responsible operator must have the required training to make use of the spill kit in emergency situations; • An appropriate number of spill kits must be available and must be located in all areas where activities are being undertaken; • 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; • All empty externally dirty drums must be stored on a drip tray or within a bunded area; • 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. 	<ul style="list-style-type: none"> • All major spills must be reported to the Contractor and ECO • The incident must be recorded and corrective action undertaken • Compliance to corrective action must be recorded and kept in the ECO file 	Contractor

<p><i>Storage areas</i></p> <ul style="list-style-type: none"> • The Contractor must ensure that diesel and other liquid fuel, oil and hydraulic fluid is stored in appropriate storage tanks or in bowsers; • The tanks/ bowsers must be situated on a smooth impermeable surface (concrete) with a permanent bund. The impermeable lining must extend to the crest of the bund and the volume inside the bund must be 130% of the total capacity of all the storage tanks/ bowsers (110% statutory requirement plus an allowance for rainfall); • The floor of the bund must be sloped, draining to an oil separator; • The banded area must be of sufficient capacity to contain a spill / leak from the stored containers; • Banded areas to be suitably lined with a SABS approved liner; • No unauthorised access into the hazardous substances storage areas must be permitted; • No smoking must be allowed within the vicinity of the hazardous storage areas; • Adequate fire-fighting equipment must be made available at all hazardous storage areas. 		
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Workshop, equipment / vehicle maintenance and storage

Impact management outcome: Soil, surface water and groundwater contamination is minimised

Mitigation / Management actions	Monitoring	Responsible for Implementation
<ul style="list-style-type: none"> • Proper maintenance procedures for vehicles and equipment must be followed; • All construction vehicles should be serviced on a regular basis to minimise the risk of oil spillage on site (servicing to take place within the site camp). • Where possible and practical all maintenance of vehicles and equipment must take place off-site or in the workshop area with appropriate spill management procedures in place; • During servicing of vehicles or equipment, especially where emergency repairs are effected outside the workshop area, a suitable drip tray must be used to prevent spills onto the soil; • Leaking equipment must be repaired immediately or be removed from site to facilitate repair; • Workshop areas must be monitored for oil and fuel spills; • Appropriately sized spill kit kept onsite relevant to the scale of the activity taking place must be available; • The workshop area must have a banded concrete slab that is sloped to facilitate runoff into a collection sump or suitable oil / water separator where maintenance work on vehicles and equipment can be performed; • Water drainage from the workshop must be contained and managed. • Should any transfer of vehicle fuel takes place on site, it is important to demarcate a specific area for this 	<p>Workshop and refuelling areas must be inspected at least once per week and corrective actions given where appropriate</p>	<p>Contractor</p>

<p>purpose. This area should be covered with an impermeable layer to prevent any penetration of fuel and oil spillage into the soil.</p> <ul style="list-style-type: none"> • When not in use, construction vehicles must be parked in an area provided with an impermeable layer to prevent leaks and spills from penetrating the substrate. 		
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Batching areas

Impact management outcome: Minimise spillages and contamination of soil, surface water and groundwater		
Mitigation / Management actions	Monitoring	Responsible for Implementation
<ul style="list-style-type: none"> • Concrete mixing must be carried out on an impermeable surface; • Batching areas must be fitted with a containment facility for the collection of cement laden water. • Dirty water from the batching area must be contained to prevent soil and groundwater contamination • Bagged cement must be stored in an appropriate facility and at least 10m away from any water courses, gullies and drains; • Concrete mixing must only take place within designated areas; • Ready mixed concrete must be utilised where possible; • A washout facility must be provided for washing of concrete associated equipment; • Hardened concrete from the washout facility or concrete mixer can either be reused or disposed of at an appropriate licensed disposal facility; • Empty cement bags must be secured with adequate binding material if these will be temporarily stored on site; • Sand and aggregates containing cement must be kept damp to prevent the generation of dust; • Any excess sand, stone and cement must be removed or reused from site on completion of construction period and disposed at a registered disposal facility; • Batching areas must be clearly demarcated. 	<p>The ECO must undertake daily site inspections of the batching area(s)</p>	<p>Contractor</p>

Blasting (if applicable)

Impact management outcome: Impact to the environment is minimised through a safe blasting practice		
Mitigation / Management actions	Monitoring	Responsible for Implementation
<ul style="list-style-type: none"> - Any blasting activity must be conducted by a suitably licensed blasting contractor; and - Notification to surrounding landowners, emergency services and site personnel must be giving 24 hours prior to 	<p>The ECO must keep records of notification prior</p>	<p>Blasting Contractor</p>

any blasting activity taking place.	blasting taking place	
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Dust control

Impact management outcome: Dust prevention measures are applied to minimise the generation of dust		
Mitigation / Management actions	Monitoring	Responsible for Implementation
<ul style="list-style-type: none"> Take all reasonable measures to minimise the generation of dust to the satisfaction of the ECO; Sweeping of construction sites, clearing of building rubble and debris and watering of construction sites (storage areas, roads, etc.) must take place on a regular basis and as determined by the ECO to prevent dust pollution; Removal of vegetation must be avoided until such time as soil stripping is required and similarly exposed surfaces must be re- vegetated or stabilised as soon as is practically possible; Ensure exposed areas remain moist through regular water spraying during dry, windy periods. Excavation, handling and transport of erodible materials must be avoided under high wind conditions or when a visible dust plume is present; During high wind conditions, the ECO must evaluate the situation and make recommendations as to whether dust- damping measures are adequate, or whether working will cease altogether until the wind speed drops to an acceptable level; Where possible, soil stockpiles must be located in sheltered areas where they are not exposed to the erosive effects of the wind; Where erosion of stockpiles becomes a problem, erosion control measures must be implemented at the discretion of the ECO; Vehicle speeds must not exceed 40 km/h along dust roads or 20 km/h when traversing unconsolidated and non- vegetated areas; Material loads must be covered properly during transport and storage thereof. 	<p>The ECO must focus on dust monitoring during especially windy conditions and remedial actions provided as required</p>	<p>Contractor</p>

Noise

Impact management outcome: Prevent unnecessary noise to the environment by ensuring that noise from development activity is mitigated		
Mitigation / Management actions	Monitoring	Responsible for Implementation
<ul style="list-style-type: none"> The Contractor must keep noise level within acceptable limits; Restrict the use of sound amplification equipment when really needed and for emergency only; 	<ul style="list-style-type: none"> Any complaints regarding noise must be 	<p>Contractor</p>

<ul style="list-style-type: none"> • Equipment that is fitted with noise reduction facilities (e.g. side flaps, silencers, etc.) must be used as per operating instructions and maintained properly during site operations; • Where possible or applicable, provide transport to and from the site on a daily basis for construction workers; • Develop a Code of Conduct for the construction phase in terms of behaviour of construction staff. • Construction site yards, workshops, concrete batching plants, and other noisy fixed facilities should be located well away from noise sensitive areas. • Stationary noisy equipment such as compressors and pumps should be encapsulated in acoustic covers, screens or sheds where possible. Portable acoustic shields could be used in the case where noisy equipment is not stationary (i.e. angle grinders, chipping hammers). • All diesel powered equipment must be regularly maintained and kept at a high level of maintenance. This must particularly include the regular inspection and, if necessary, replacement of intake and exhaust silencers. Any change in the noise emission characteristics of equipment must serve as trigger for withdrawing it for maintenance. • Construction activities involving use of service vehicles, machinery, hammering etc, must be limited to the hours between 7:00 am and 6 pm weekdays and Saturdays; no noisy activities may take place on Sundays or Public Holidays. • With regard to unavoidable very noisy construction activities in the vicinity of noise sensitive areas (such as farmsteads), the contractor should liaise with local residents and owners on how best to minimise impact, and the local population should be kept informed of the nature and duration of intended activities. 	<p>recorded by the ECO and communicated to the guilty parties – penalties may be enforced</p> <ul style="list-style-type: none"> • The Code of Conduct must enforced at all times 	
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Fire prevention

Impact management outcome: Prevention of uncontrollable fires		
Mitigation / Management actions	Monitoring	Responsible for Implementation
<ul style="list-style-type: none"> • Provide designate smoking areas where the fire hazard could be regarded as significant; • Firefighting equipment must be available on all vehicles located on site; • The local Fire Protection Agency (FPA) must be informed of construction activities; • Contact numbers for the FPA and emergency services must be communicated in environmental awareness training and displayed at various locations on site such as site offices, workshop, refuelling areas and eating areas; • The adjacent land users must be informed and/or involved in case of any fire; • It must be ensured that the basic fire-fighting equipment is supplied to the site office, kitchen areas, workshop 	<p>The ECO must ensure that signage and emergency numbers are displayed on site</p>	<p>Contractor</p>

<p>areas and stores;</p> <ul style="list-style-type: none"> • Welding gas cutting or cutting of metal will only be allowed inside the working/demarcated areas and with appropriate fire-fighting equipment at hand; • “No smoking” signs must be placed in visible areas on site; • No fires may be made for the burning of vegetation and waste; • No open fires are to be made on site – cooking facilities must be provided to personnel and labourers; • No firewood may be collected from nearby land. 		
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Excavation of foundations and trenching

Impact management outcome: No environmental degradation occurs as a result of excavation of foundations and trenching		
Mitigation / Management actions	Monitoring	Responsible for Implementation
<ul style="list-style-type: none"> • All excess soil generated during foundation excavation must be disposed of in an appropriate manner and at a licensed landfill site, if not used for backfilling purposes; • Soil can be used for landscaping purposes and must be covered with a layer of 150mm topsoil for rehabilitation purposes; • All soil must be replaced in the layers in which it was excavated (with the topsoil being the top-layer); • Excavations for trenches must be done portion by portion and covered as soon as a section of the pipe/cable had been laid; • Shaping (to blend into the landscape) and stabilisation of the slopes (where applicable) must be done via rock protection, topsoil redistribution, etc. • The area must be rehabilitated and reseeded after the pipeline/cables had been laid. 	<p>The ECO must oversee excavation / trenching activities, thereby ensuring that topsoil is being stockpiled separately and are replaced as the last layer when the trenches are closed up</p>	<p>Contractor</p>

Stockpiling and stockpile areas

Impact management outcome: Reduce erosion and sedimentation as a result of stockpiling		
Mitigation / Management actions	Monitoring	Responsible for Implementation
<ul style="list-style-type: none"> • All excavated material must be stored appropriately on site in order to minimise impacts to watercourses; • All stockpiled material must be maintained and kept clear of weeds and alien vegetation growth by undertaking regular weeding and control methods; • Topsoil stockpiles must not exceed 1.5m in height; 	<p>The ECO must guide the position of the stockpiles Stockpiles must be checked at least once per month for</p>	<p>Contractor</p>

<ul style="list-style-type: none"> • Where possible, sandbags (or similar) must be placed at the bases of the stockpiled material in order to prevent erosion of the material. • No stockpiling shall occur outside of the working area or within drainage channels or any watercourse; • During periods of strong winds and heavy rain, the stockpiles must be covered with appropriate material (e.g. cloth, tarpaulin etc.) where possible. 	alien vegetation growth	
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Erosion

Impact management outcome:		
Mitigation / Management actions	Monitoring	Responsible for Implementation
<ul style="list-style-type: none"> • The SWMP compiled during the Planning and Design Phase must be implemented. • Access roads and site surfaces must be monitored for deterioration and possible erosion. Pro-active measures must be implemented to curb erosion and to rehabilitate eroded areas. • All areas susceptible to erosion must be installed with temporary and permanent diversion channels and berms to prevent concentration of surface water and scouring of slopes and banks, thereby countering soil erosion. • To reduce the risk of erosion, run-off over the exposed areas should be mitigated to reduce the rate and volume of run-off and prevent erosion towards any watercourse. • Construction during the dry months of the year should be considered in order to overcome the problems caused by excessive moisture and prevent soil being washed away towards lower-lying areas and watercourses. • If construction is done during the wet months, watercourse areas could be protected against soil erosion, i.e. with sandbags packed along its edge to prevent any soil washed into the system during rainfall events. • Rehabilitation and re-vegetation should preferably take place before commencement of the rainy season. • Storm water control measures should be implemented especially around stockpiled soil, excavated areas, trenches etc. especially to avoid the export of soil into the water course. • The storm water system must be constructed in such a way that the force of the water entering watercourse systems is broken to prevent any possibility of erosion taking place. • Any erosion channels developed during the construction period or during site vegetation establishment period must be back-filled and compacted and the areas restored to a proper condition. • The Contractor must at all times ensure that cleared areas are effectively stabilised to prevent and control erosion. • Stockpiling of soils should take place as follows :- <ul style="list-style-type: none"> ○ Soil stockpiles must be protected from possible erosion, e.g. through covering of the stockpiles with 	<ul style="list-style-type: none"> • ECO must check the site, especially roads, foot paths and stockpile areas at least twice per month for signs of erosion • Remedial action must be undertaken where required and documented • Photographic records must be kept 	Contractor

<ul style="list-style-type: none"> ○ tarpaulin and limiting the height and slope of the stockpile ○ Soil stockpiles should not exceed 1.5m in height ○ Soil stockpiles must be sufficiently away from drainage areas ● No development activities may take place within any watercourse and buffer zone without water use authorisation for that specific activity is in place. 		
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Community liaison, safety and security

Impact management outcome:		
Mitigation / Management actions	Monitoring	Responsible for Implementation
<p><i>Community liaison</i></p> <p>Reasonable liaison must be maintained with surrounding businesses and landowners to ensure that the following is effected:</p> <ul style="list-style-type: none"> ● Feedback on the environmental performance of the project must take place if and when required. ● A complaints' register needs to be opened and maintained. The register must contain the contract details of the person who made complaints and information regarding the complaint itself, including the date of submission. ● Any conservation authority and/or government institution should be allowed reasonable access to the construction site on request and arrangement with the Contractor and/or ECO. <p><i>Labourers</i></p> <ul style="list-style-type: none"> ● In order to prevent and/or minimise crime, it is strongly recommended that only guarding personnel be supplied with controlled serviced accommodation. ● All construction workers will be allowed only for specified day light hours. ● Transport should be made available by the Contractor to remove labourers from the site after working hours. ● Supervision of labourers must at all times take place. ● No wandering on adjacent properties is allowed. 	<p>The ECO must keep record of all communication taking place with the community and landowners</p>	<p>Contractor ECO</p>

Uncontrolled labour force

Impact management outcome:		
Mitigation / Management actions	Monitoring	Responsible for

		Implementation
<p>Labourers should be trained in general principles of environmental management that includes the following :</p> <ul style="list-style-type: none"> • Removal of agricultural products is prohibited • No plants may be collected • No firewood may be collected • No open fires are to be made • No wandering on adjacent properties is allowed • No access to the watercourse areas is allowed • No watercourse may be used for any purpose (i.e. drinking water, washing, laundry, etc.) • The veld may not be used for any toilet needs • Secure accommodation facilities must be provided for guarding personnel (if applicable) • Supervision of labourers must at all times take place 	<p>The ECO must keep a register of Non-compliance and fines should be given for entering the no-go areas, adjacent properties, etc</p>	<p>Contractor</p>

Traffic

Impact management outcome:		
Mitigation / Management actions	Monitoring	Responsible for Implementation
<ul style="list-style-type: none"> • Comply with the Traffic and Transportation Management Plan; • Ensure that all drivers are aware of the “No- Go” areas, permissible roads, and where the offloading area is; • Impose speed limits on the construction site; • Manage site access to prevent congestion of vehicles and trucks; • Access of all construction and material delivery vehicles should be strictly controlled, especially during wet weather to avoid compaction and damage to the topsoil structure; • Roads not to be used shall be marked with a “NO ENTRY for construction vehicles” sign; • Access roads are to be kept litter free; • Transportation of materials must be done by the least amount of trips to prevent the construction vehicles from congesting the main roads leading to the construction site; • The contractor must ensure that there is ample space to off load the materials to prevent trucks being delayed and interrupting the traffic flow. 	<p>The ECO must keep a copy of the TMP on site and must compare performance to standards stipulated therein</p>	<p>Project Manager Contractor</p>

7.3 Erosion Management Plan

The main philosophy used for Civil Works should be “Light on Land” (LoL) and the objective is to respect the existing site conditions and avoid unnecessary soil disturbance. The design is to adapt the product to the original slope of the ground as far as possible whilst considering the resultant impact to the original environmental site conditions.

Erosion Control

- The Contractor shall take all reasonable measures to limit erosion and sedimentation due to the construction activities.
- Where erosion and/or sedimentation, whether on or off the site, occurs despite the Contractor complying with the foregoing, rectification shall be carried out in accordance with details specified by the ECO.
- Where erosion and/or sedimentation occur due to the fault of the Contractor, rectification shall be carried out to the reasonable requirements of the ECO.
- Any runnels or erosion channels developed during construction or during the defects liability period shall be backfilled and compacted.
- Stabilisation of cleared areas to prevent and control erosion shall be actively managed. Consideration and provision shall be made for various methods, namely, brush cut packing, mulch or chip cover, straw stabilising (at a rate of one bale / 20m² and rotated into the top 100mm of the completed earthworks), watering, soil binders and anti-erosion compounds, mechanical cover or packing structures (e.g. Hessian cover).
- Traffic and movement over stabilised areas shall be restricted and controlled, and damage to stabilised areas shall be repaired and maintained to the satisfaction of the Engineer.
- Natural vegetation will be retained wherever possible and vegetation clearance will be restricted to only the areas needed for the execution of the works and rocks shall not be removed unless necessary for the safe movement of construction vehicles and the installation of equipment, keeping disturbance to a minimum to reduce the loss of material by erosion.
- Erosion control is to be implemented on any cleared areas where wind or water erosion is potentially a problem. The topsoil and vegetation are to be disturbed as little as possible by keeping “green areas” and controlling traffic.
- Crushing shall be favoured over uprooting to promote regeneration and prevent unnecessary erosion. Where uprooting is necessary, mechanical methods shall be favoured and cleared areas shall be stabilised as soon as possible.
- Off-road vehicle movement destroys vegetation and creates erosion problems. Vehicle movement during construction shall therefore be planned for within the design phase to ensure maximum protection of vegetation. No vehicular or pedestrian access will be permitted into natural areas beyond the demarcated boundary of the work area.
- Light equipment is to be utilised for access and deliveries into areas of unstable soils and in areas where erosion is evident wherever possible.
- Traffic flow, both vehicular and pedestrian, shall be strictly prohibited in areas outside of the designated work areas. In addition, once construction has been completed within a section, this section shall be deemed restricted.

Erosion Protection

- Protect all areas susceptible to erosion and ensure that there is no undue soil erosion resultant from activities within and adjacent to the construction camp and work areas.
- Retain natural trees, shrubbery, and grass species wherever possible.
- Do not permit vehicular or pedestrian access into natural areas beyond the demarcated boundary of the Work Area.

- Avoid access into seasonally wet areas and / or turf soils during and immediately after rainy periods, until such a time that the soil has dried out.
- Utilise only light equipment for access and deliveries into areas of unstable soils, in areas where erosion is evident, and at stream and river embankments, as far as reasonably practicable.
- Limit vehicular access to rocky outcrops and ridges.
- Institute adequate sedimentation control measures at river crossings and when excavation or disturbance within riverbanks or the riverbed takes place.
- Address erosion donga crossings as river crossings, applying soil erosion control and bank stabilisation procedures as specified by the ECO.
- Do not allow erosion to develop on a large scale before effecting repairs. When in doubt, seek advice from the ECO.
- Repair all erosion damage as soon as possible and in any case not later than six months before the termination of the Maintenance Period to allow for sufficient rehabilitation growth.
- In general, slopes steeper than 1(V):3(H) or slopes where the soils are by nature dispersive or sandy, must be stabilised. The ECO will specify a solution in terms of the most appropriate approved method and technology. One or more of the following methods may be required:
 - Topsoil covered with a geotextile, plus a specified grass seed mixture
 - A 50:50 by volume rock: topsoil mix 200mm thick, plus specified grass seed mixture
 - Logging or stepping (logs placed in continuous lines following the contours)
 - Earth or rock-pack cut-off berms
 - Benches (sandbags)
 - Packed branches
 - Ripping and / or scarifying along the contours
 - Stormwater berms
- Near vertical slopes of 1(V):1(H) or 1(V):2(H) must be stabilised using hard structures, preferably with a natural look, and with facilities allowing for plant growth. The ECO will specify a solution in terms of the most appropriate approved method and technology. One or more of the following methods may be required:
 - Retaining walls
 - Stone pitching
 - Gabions
 - Shotcrete
- Protect the slopes of all river diversions. One or more of the following methods may be used, as specified by the ECO:
 - Sandbags
 - Reno mattresses
 - Plastic liners and / or coarse rock (undersize rip-rap)
- Wherever possible, especially in sensitive areas, use rubber dams as river diversions.
- During the course of construction, the ECO may identify additional slopes in need of stabilisation and will specify actions in terms of the most appropriate approved method and technology.

Topsoil Conservation

- Ahead of all construction, borrowing and quarrying, strip the entire available topsoil layer.
- Stockpile separately from overburden (subsoil and rocky material).
- In the absence of a recognisable topsoil layer, strip the uppermost 300mm of soil.
- Co-ordinate works to limit unnecessarily prolonged exposure of stripped areas and stockpiles.
- Retain vegetation and soil in position for as long as possible, removing it immediately ahead of construction / earthworks in that area.
- Strip and stockpile herbaceous vegetation, overlying grass, and other fine organic matter along with the topsoil.
- Do not strip topsoil when it is wet.

- Store stripped topsoil in an approved location and in an approved manner for later reuse in the rehabilitation process.
- Stockpile topsoil stripped from different sites separately, as reapplication during rehabilitation must preferably be site specific. If necessary, keep a stockpile register.
- Do not mix topsoil obtained from different sites.

De-bushing and De-stumping

- Obtain permission from the ECO to proceed with debushing. Only debush specified areas.
- Utilise the method of debushing most appropriate for the environment and species in question. Favour mechanical rather than chemical methods wherever possible.
- Wood obtained from de-bushing and de-stumping remains the property of the landowner and must be stockpiled in areas designated by him and approved by the ECO.
- Dispose of remaining plant material and stumps as solid waste. Upon approval by the ECO, the plant material may be buried on site. Specifications for topsoil stripping, backfilling of excavations and rehabilitation will apply in this regard.
- Only carry out de-stumping upon instruction by the ECO. In all other instances trees must be cut as close as possible to the ground level and roots retained (for soil binding and habitat creation).

CHAPTER 8: OPERATIONAL PHASE

This section provides actions and mitigation measures to be undertaken during the operational phase of this project to ensure that sound environmental principles are being followed during the life time of this solar PV facility.

All the mitigation measures provided for the Operational Phase in the Environmental Impact Assessment Table included as Addendum B to this EMPr must also be implemented.

8.1 Site Specific EMPr: Operational Phase

This section provides actions and mitigation measures that need to be undertaken after construction has ended and during the operational phase of the project as specified by the specialists which undertook impact assessment studies as part of the EIA process. Mitigation as stipulated in the engineering reports is also included hereunder. These studies are appended to the Basic Assessment Report and can be provided on request should in-depth details be required.

Note that the mitigation as provided by the specialists may overlap, but not conflict, with the proposed general mitigation provided under paragraph 8.2 below, but both are given to ensure clarity.

Note: The ECO must monitor site clearance and be employed until rehabilitation measures have been completed

General ecological considerations

Impact management outcome: Operational activities must not degrade the ecological integrity of the site and its surrounds		
Mitigation / Management actions	Monitoring	Responsible for Implementation
The following plans must be compiled and should be followed at all times <ul style="list-style-type: none"> • Plant rescue and protection plan • Open space management plan • Rehabilitation Plan / Habitat Restoration Plan • Alien Invasive Management Plan 	Record must be kept of all actions taken as per the stipulations in these plans and photographic records should be kept	On-site Project Manager / Environmental Manager EA Holder

Fauna and flora

Impact management outcome:		
Mitigation / Management actions	Monitoring	Responsible for Implementation
<ul style="list-style-type: none"> All temporary stockpile areas, litter and dumped material and rubble must be removed and discarded at appropriate land fill sites. Undeveloped areas that were degraded due to human activities must be rehabilitated with indigenous vegetation. Hazardous chemicals must be stored on an impervious surface and protected from the elements. These chemicals must be strictly controlled, and records kept of when it was used and by whom. Artificial lighting must be restricted to security areas in order to minimise the potential negative effects of the lights on the natural nocturnal activities. <p><i>Herbicides</i></p> <ul style="list-style-type: none"> Only a registered pest control operator may apply herbicides on a commercial basis. A daily register must be kept of all relevant details of herbicide usage. No herbicides must be used in any watercourse. 	<p>Monitoring must be undertaken once per month, or as per the stipulations in the Open Space Management Plan to determine degradation of the vegetation and or animal habitat – preventative actions must be provided where required</p>	<p>On-site Project Manager / Environmental Manager EA Holder</p>

Freshwater features

Impact management outcome: Protection of ecological condition of aquatic ecosystems		
Mitigation / Management actions	Monitoring	Responsible for Implementation
<ul style="list-style-type: none"> The use of borehole water during the operational phase needs to be investigated; however, boreholes should not be sited within or immediately adjacent to wetlands. 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 or eroded. Observed invasive alien plant growth should be cleared from the sites regularly as per the stipulations in the Alien Invasive Management Plan. Storm water runoff infrastructure must be designed to mitigate both the flow and water quality impacts of any storm water leaving the developed areas. The runoff should be dissipated over a broad area covered by natural vegetation or managed using appropriate shaping with berms or channels and swales adjacent to hardened surfaces where necessary. Should any erosion features develop, they should be stabilised as soon as possible. 	<p>Follow the stipulations as per the Storm Water Management Plan, Open Space Management Plan as well as the Alien Invasive Management Plan</p>	<p>On-site Project Manager / Environmental Manager EA Holder</p>

<ul style="list-style-type: none"> Any water supply, sanitation services as well as solid waste management services required for the sites should preferably be provided by an off-site service provider. 		
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Stormwater management

Impact management outcome: Ensure that storm water doesn't contribute to soil erosion and degradation of watercourses		
Mitigation / Management actions	Monitoring	Responsible for Implementation
<ul style="list-style-type: none"> A SWMP is to be implemented during the operation of the facility. The plan must ensure compliance with applicable regulations and prevent off-site migration of contaminated storm water or increased soil erosion. The plan must include the implementing of appropriate design measures that will allow surface and subsurface movement of water along drainage lines so as not to impede natural surface and subsurface flows. Drainage measures must promote the dissipation of stormwater run-off. The SWMP should specifically address the impact an increase of storm water could have on adjacent farmlands. 	Follow the stipulations as per the SWMP	On-site Project Manager / Environmental Manager EA Holder

Visual resources

Impact management outcome: Ensuring the rural character of the area remains as far as possible		
Mitigation / Management actions	Monitoring	Responsible for Implementation
<p><i>Lighting</i></p> <ul style="list-style-type: none"> Lights at night have the potential to significantly increase the visual exposure of the proposed project and general mitigation should be employed to reduce light pollution, i.e. light should be directed downwards to where it is needed, LED lights should be used wherever possible and lighting should only be placed where required, and not for the creation of ambiance. The security fencing around the PV panels should not have security lighting. No overhead lighting can be used. <p><i>Trees</i></p> <ul style="list-style-type: none"> Trees within the road buffers should be retained for visual screening, with further indigenous trees allowed to grow. Planting of medium-sized screening trees along the farm roads to assist in reducing the intensive, High Exposure views of the PV panels (10m spacing between trees is recommended). 	Driving around the site at night should be done periodically to ensure that light pollution does not take place	On-site Project Manager / Environmental Manager EA Holder

<ul style="list-style-type: none"> • Site camps, BESS, generator units, etc. need to be screened by the planting of medium sized indigenous trees to allow for visual screening. • Continued maintenance of the avenue of trees along the R76. 		
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Employment and business opportunities and support for local economic development

Impact management outcome: Creation of employment and business opportunities and support for local economic development		
Mitigation / Management actions	Monitoring	Responsible for Implementation
<p>The positive impact can be enhanced by implementing the following enhancements:</p> <ul style="list-style-type: none"> • Implement a Skills Development and Training Programme aimed at maximising the number of employment opportunities for local community members. • Maximise opportunities for local content, procurement, and community shareholding. 	Implement the Skills Development and Training Programme	On-site Project Manager / Environmental Manager EA Holder

Establishment of a Community Trust

Impact management outcome: Maximise the benefits and minimise the potential for corruption and misappropriation of funds		
Mitigation / Management actions	Monitoring	Responsible for Implementation
<p>In order to maximise the benefits and minimise the potential for corruption and misappropriation of funds of the Community Trust, the following measures should be implemented:</p> <ul style="list-style-type: none"> • The MLM should liaise with the EA Holders of other renewable energy projects in the area to investigate how best the Community Trusts can be established and managed so as to promote and support local, socio-economic development in the region as a whole. • The MLM should be consulted as to the structure and identification of potential trustees to sit on the Trust. The key departments in the MLM that should be consulted include the Municipal Manager, IDP Manager and LED Manager. • 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. • Strict financial management controls, including annual audits, should be instituted to manage the funds generated for the Community Trust from the PV facility. 	The Community Trust should be audited once per year	On-site Project Manager / Environmental Manager EA Holder

Traffic

Impact management outcome: Minimal disruption to existing traffic patterns		
Mitigation / Management actions	Monitoring	Responsible for Implementation
<ul style="list-style-type: none"> Water deliveries, staff trips and trips for maintenance requirements could be staggered or scheduled to occur outside of peak traffic periods. Consider scheduling shift changes to occur outside peak hours to concentrate staff trips in off peak periods. <p><i>Traffic & Transport Management Plan</i></p> <ul style="list-style-type: none"> The TMP must be reviewed annually or immediately after an incident and corrective measures must be incorporated into the Plan. <p><i>Cleaning of panels</i></p> <ul style="list-style-type: none"> Staff and general (maintenance) trips should occur outside of peak traffic periods as far as possible. Should municipal water not be available, water will have to be transported to the site. The provision of onsite water tanks will reduce traffic flow. Water bowsers trips should occur outside of peak traffic periods as far as possible. Using a larger water bowser will also reduce traffic flow. <p><i>Maintenance of roads</i></p> <ul style="list-style-type: none"> Any gravel roads used by vehicles visiting the facility during the operational phase must be maintained and repaired when damaged, if and where required. Dust suppression of any gravel roads during the operational phase must take place if and where required. 	<p>A copy of the TMP must be kept at the PV facility and a designated employee must ensure that the plan is enforced and must make sure that the Plan is available to all relevant personnel and external maintenance/repair teams</p>	<p>On-site Project Manager / Environmental Manager EA Holder</p>

General maintenance

Impact management outcome: Ensuring that maintenance of the site does not impact negatively on the ecological integrity of the site and its surrounds		
Mitigation / Management actions	Monitoring	Responsible for Implementation
<ul style="list-style-type: none"> The tracks and pathways between the PV panels should be properly maintained and brush-cut as and when 		<p>On-site Project</p>

<p>required;</p> <ul style="list-style-type: none"> • All roads should be checked for any signs of erosion and remedial action should be taken immediately. The effectiveness of these remedial actions must be monitored – photographic evidence will assist greatly in this regard; • Stipulations as per the SWMP must be followed at all times; • Environmental education should be given to all onsite permanent staff; • No hunting, killing or harvesting of plants and animals may occur under any circumstance; • Vegetation growth under and between the PV panels must be allowed to assist in dust reduction measures; • The perimeter fence should be checked regularly to ensure that no animals are stuck, that the fence allows for passage of small mammals and that the electrical strands are not causing animal electrocution; • Any oil, or any other hazardous substance spills should be contained, cleaned up and contaminated soil or materials should be disposed of at a registered disposal site for hazardous materials. 		<p>Manager / Environmental Manager EA Holder</p>
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Battery Energy Storage Systems

Many potential problems could 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.

Main processes/activities and some details of likely elements

MAIN PROCESSES	DETAILS
Chemical electrolyte and electrode materials in the battery cell	Will most likely be solid state lithium-ion batteries but could be sodium-sulphur solid state batteries.
Battery cells, modules and racks typically in shipping containers	The facilities are designed for up to 120MW and eight hours storage (960 MWh) having typically ±100 containers (i.e., each Tesla Megapack has up to 3 megawatt hours (MWhs) of storage and 1.5MW of inverter capacity)
Electronic equipment in container	Battery management system for monitoring of the batteries and control of the loading and unloading cycles
Electrical equipment in container or separate container	Power conversion system, connections, switches, cabling
Mechanical equipment in container(s)	Air conditioners, fans, filters, coolant
Electrical equipment outside the containers	Network interconnection equipment, switchgear, transformers
Site office and workshop	Including potable water, 220V power, kitchen, sewage, tools and parts store etc
Support services	Dirt roads, access control fences, lights inside the container and outside for general access lighting, fire suppression/fighting systems, grass cutting, communication systems

Waste	Broken parts, storm water run-off, hot air from battery and PCS cooling systems
Solid State Lithium-ion or Sodium-Ion (Sodium-Sulphur) chemical waste	Batteries, air filters, transformer oils, coolants, contaminated soil
Electronic waste	Circuit boards, HMI screens
Building rubble - non-hazardous waste	Steel, copper, cement, equipment and structures
Battery Containers	Shipping containers

Receptor	Description	Preventative and Mitigation Measures
Human Health - chronic exposure to toxic chemical or biological agents	<p>Causes - Operation and maintenance materials spare parts, paints, solvents, welding fumes, diesel fuel, transformers oils, lubricating oils and greases etc.</p> <p>Consequences - Occupational illness.</p>	<ul style="list-style-type: none"> • The operation and maintenance phase will be managed according to all the requirements of the Occupational Health and Safety Act 85 of 1993. • SHEQ policy in place. • 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. • SHE procedure in place, e.g., PPE specified, management of change, integrity monitoring. • SHE appointees in place. • Training of staff in general hazards on site. • 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. • Emergency response plan for full operation and maintenance phase to be in place prior to beginning commissioning and to include aspects such as: <ul style="list-style-type: none"> ○ appointment of emergency controller, ○ emergency isolation systems for electricity, ○ emergency isolation and containment systems for electrolyte, ○ provision of PPE for hazardous materials response, ○ provision of emergency facilities for staff at the main office building, ○ provision of first aid facilities, ○ first responder contact numbers etc.

Receptor	Description	Preventative and Mitigation Measures
Human Health - chronic exposure to toxic chemical or biological agents	<p>Causes - Compromised battery compartments vapours accumulate in the containers, solids/liquids on surfaces.</p> <p>Maintenance of battery components, corrosive and mildly toxic liquid on surfaces.</p> <p>Consequences - Dermatitis, skin /eye/lung irritation.</p>	<ul style="list-style-type: none"> • Solids state batteries sealed, individual batteries in modules which are also sealed, pre-packed in the container. • Maintenance procedures will be in place should equipment need to be opened, e.g. pumps drained and decontaminated prior to repair in workshop etc. • PPE will be specified for handling battery parts and other equipment on site. • Training of staff in hazards of chemicals on site. • Possible detectors with local alarms if regulated occupational exposure limits are exceeded etc prior to entry for inspection of battery containers. • Labelling of all equipment. • Confined space entry procedures if entering tanks and possibly battery containers? • There needs to be careful thought given to procedures to be adopted before entering into the plant or a container under normal circumstances (confined space) but particularly after a BMS shut down where there may be flammable or toxic gases present, a fire etc. Any situation could await those entering. • Safety Data Sheets (SDSs) to be available on site. • Operating manuals to be provided including start-up, shut-down, steady state, monitoring requirements. • Maintenance manuals with make safe, decontamination and repair procedures. • Proposed maintenance schedules daily, weekly, monthly, annual etc. • Provided portable equipment for calibration and for testing/verification of defective equipment, e.g. volt/current meters, infrared camera
Human Health - exposure to noise	<p>Causes - Moving parts inside containers, buildings, pumps, compressors, cooling systems, diesel generators etc.</p> <p>Consequences - Adverse impact on hearing of workers.</p> <p>Nuisance factor at near -by residences or other activities.</p>	<ul style="list-style-type: none"> • Design to ensure continuous noise does not exceed 85dB in the plant or at any other location on site or 61 dB at the site boundary, e.g., emergency generator, air compressor etc. • Employees to be provided with hearing protection if working near equipment that exceeds the noise limits.
Human Health	Causes - Heat during the day.	<ul style="list-style-type: none"> • Building and container facilities to comply with Occupational Health and Safety Act 85 of 1993 specifically

Receptor	Description	Preventative and Mitigation Measures
- exposure to temperature extremes and/or humidity	<p>Batteries generate heat within enclosed building / containers. Cold in winter. Night work requires lighting.</p> <p>Consequences - Heat stroke. Hypothermia.</p>	<p>the thermal, humidity, lighting and ventilation requirements of the</p> <ul style="list-style-type: none"> ● Environmental Regulations for Workplaces. ● Battery life optimal at temperature also optimal for humans. ● Lighting to be provided inside the building, inside the containers, possibly linked to the door opening and outdoors where necessary. ● Adequate potable water to be provided during all phases of the project. ● Suitable lighting to be provided including emergency lighting for safe building exit in the event of power failure. ● PPE for operations and maintenance staff to be suitable for the weather conditions.
Human Health - exposure to psychological stress	<p>Causes - Isolated workstation and monotonous repetitive work. Consequences - Low performance, system productivity suffers.</p>	<ul style="list-style-type: none"> ● Staff rotation to other activities within the site may be necessary. ● Performance monitoring of inspections / maintenance tasks in particular will be necessary.
Human Health - exposure to ergonomic stress	<p>Causes - Lifting heavy equipment. Awkward angles during maintenance, stretching reaching to high level and bending to low level. Working at height if equipment located on top of roofs or elevated electrical equipment (e.g., pylons). Consequences - Back and other injuries.</p>	<ul style="list-style-type: none"> ● Training in lifting techniques. ● Training in working at heights. ● If equipment is at height, ensure suitable safe (electrically and physically) ladders / harnesses etc. are available. ● Working at height procedure to be in place.

Receptor	Description	Preventative and Mitigation Measures
<p>Human and Equipment Safety - exposure to fire radiation</p>	<p>Causes – Involvement in an external fire e.g., veld fire, maintenance vehicle fire, diesel generator fire, electrical systems fire. Manufacturing defects or damage to battery leading to shorting and heating. High humidity condensation of water or ingress of water or flooding leading to shorting. Dust accumulation on electrical parts leading to overheating. Excessive electrical loads - surges Operator abuse BMS failure or software failure. Incorrect extinguishing medium, escalate the fire.</p> <p>Consequences - Contaminated run off. Radiation burns unlikely to be severe as no highly flammable materials on site. No affected bystanders. Damaged equipment. Fire spreads to other units or offsite if grass/vegetation not controlled.</p>	<ul style="list-style-type: none"> • Grass cutting and fire breaks around the BESS installations to prevent veld fires, i.e., ensure suitable separation between BEES and any crops grown in the area. No combustible materials to be stored in or near the batteries or electrical infrastructure. • Separation of site diesel tank, gen-set, transformers from BESS and vice versa. • Design codes from USA and standards of practice UL9540, NFPA 855 and DNV GL RP 43. Detailed FMEA/Hazop/Bowtie to done during design at the component level and system levels. 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. Abuse tests conducted by supplier. • 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. Protective systems are only as good as their reliability and functionality testing is important, e.g., testing that all battery plant trips actually work. Fire resistant barrier between the batteries and the PCS side if in the same container, or separate containers. • 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 and alerts in the main control room. • 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. • Data indicates an event frequency of 0.001 per installation and with 100 units this would mean an event once 10 years. Low probability. Most events will be small not resulting in injuries, but this is possible if the event is not controlled. • Emergency plan from transport and construction phase to be extended to 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, full face shields, BA sets. • A planned fire response to prevent escalation to an explosion is critical. A planned fire response to

Receptor	Description	Preventative and Mitigation Measures
		<p>prevent escalation to an environmental event is critical.</p> <ul style="list-style-type: none"> • Suitable fire extinguishing medium, and cooling mediums and adequate supply of both is critical. Water supply may be an issue. • Consider fire water for cooling adjacent equipment – BESS units. • Can use fogging nozzles to direct smoke. • Clean up after event Lingered HF and other toxic residues in the soil and on adjacent structures. • IR scanning to determine if batteries are still smouldering / are sufficient cooled to handle. Very NB batteries thought to be extinguished can re-ignite days/weeks later. • Some emergency response plans suggest after batteries are removed; they still be submerged in outdoor water troughs. To be confirmed during design. • 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
Human and Equipment Safety - exposure to fire radiation	<p>Causes - Power Conversion System (PCS – DC to AC) cooling failure electrical fire. Consequences - Fire starts in PCS or another section or room and spreads to battery area.</p>	<ul style="list-style-type: none"> • Modern lithium container design put the PCS in another part of the container with a fire rated wall separating it from the battery. Alternately the PCS is another container altogether. • Failure of cooling on PCS or fires on other electrical equipment such as cooling system pump motors etc, and failure to trip the entire system and raise the alert.

Receptor	Description	Preventative and Mitigation Measures
Human and Equipment Safety - exposure to explosion over pressures	<p>Cause 1 - Transformer shorting / overheating / explosion.</p> <p>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.</p> <p>Consequences - Potential fatalities amongst first responders. Damage to container or other nearby items, e.g., another container.</p>	<ul style="list-style-type: none"> • Electrical equipment will be specified to suit application. • Emergency response plan and employee training referred to above is critical. • This is only really likely do happen due to possible inappropriate emergency response, e.g. opening containers when they may be the type that should be left to burn out. • Modern state of the art containers have ventilation systems for vapours. • Undertake a hazardous area classification of the inside of the container to confirm the rating of electrical equipment. Might be zone 2 due to possible leaks of electrolyte or generation of flammable gases under thermal run away. Emergency response plan and employee training referred to above is critical • Suitable training of selected emergency responders who may be called out to the facilities is critical.
Human and Equipment Safety - exposure to acute toxic chemical and biological agents	<p>Causes Human pathogens and diseases, sewage, food waste. Snakes, insects, wild and domesticated animals and harmful plants.</p> <p>Consequences - Illness and at worst without mitigation, possibly extending to fatalities.</p> <p>Effects can vary from discomfort to fatalities for venomous snakes or bee swarms etc</p>	<ul style="list-style-type: none"> • All necessary good hygiene practices to be in place, e.g. provision of toilets, eating areas, infectious disease controls. • Policies and practice for dealing with known vectors of disease such as Aids, TB, COVID 19 and others. • 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. • 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

Receptor	Description	Preventative and Mitigation Measures
Human and Equipment Safety - exposure to acute toxic chemical and biological agents	<p>Causes - Damaged batteries components, leak electrolyte, are completely broken exposing hazardous chemicals. Hazardous fumes released on thermal run away see fire above.</p> <p>Consequences - Impacts can vary from mild skin irritation from exposure to small leaks to serious corrosive burns for large exposure.</p> <p>In the case of toxic fumes / smoke, serious lung damage.</p>	<ul style="list-style-type: none"> • Acid resistant PPE (e.g., overalls, gloves, eyeglasses) to be specified for all operations in electrolyte areas. • 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. • All operators/maintenance staff trained in the hazards of chemicals on site. • Batteries contained, modules contained and all inside a container that acts as bund. • Refer to fire above as all the protective measures apply to prevent toxic smoke. • Fumes tend to be directed upwards by the structure of the container. • Refer to fire above as all the measures apply to mitigate toxic smoke. • 24/7 helpline response. • Standard dangerous goods requirements for Hazmat labels. • All operators/maintenance staff trained in the hazards.
Human and Equipment Safety - exposure to violent release of kinetic or potential energy	<p>Causes - Moving equipment, pumps, heavy equipment at elevation, nip points, working at heights. Traffic accidents. Earthquake / tremor.</p> <p>Consequences - Injury. Fatality in unlikely worst case, e.g., traffic accidents or fall from heights. Damage to equipment, spills, environment pollution</p>	<ul style="list-style-type: none"> • Apart from pumps, no major moving parts during operation. • Maintenance equipment to be serviced and personnel suitably trained in the use thereof. • Normally just small vehicles on site, bakkies, grass cutting, cherry-pickers etc. Possibly large cranes if large equipment or elevated structure removed/replaced. • Traffic signs, rules etc in place on site. • All normal working at heights, hot work permits, confined space entry, cordon off unsafe areas/works etc to be in place. • Emergency response plan. • Civil design to take seismic activity into account.

Receptor	Description	Preventative and Mitigation Measures
<p>Human and Equipment Safety - exposure to electromagnetic waves</p>	<p>Causes - Use of electrical machines, generators etc. Hot dry area static generation is highly likely. Lightning strike. Consequences - Electrocution. Ignition and burns. Injury and death. Damage electrical equipment.</p>	<ul style="list-style-type: none"> • Codes and guidelines for electrical insulation. • PPE to suit. • Low voltage equipment (e.g., batteries) separated from high voltage (e.g., transmission to grid). • Trained personnel – IEE 1657 – 2018. • Eskom Operating Regulations for high voltage systems including access control, permit to work, safe work procedures, live work, abnormal and emergency situations, keeping records. • Electromagnetic fields, impact on other equipment e.g., testing devices, mobile phones – malfunction, permanent damage. • Software also needs maintenance, patches, updates. • Consider suitably located Emergency stop buttons for the plant and the other equipment on site. • PPE to consider static accumulation for entering the plant, and particularly the battery containers especially after a high temperature shut down where there could possibly be flammable materials. • 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. • Lightning strike rate in proposed development area is moderately high. • All outside work must be stopped during thunder storms. • Lightning conductors may be required for the installation, to be confirmed during design
<p>Environment - emissions to air</p>	<p>Not expected on a normal basis. Refrigerant may be an asphyxiant if accidentally released indoors it can accumulate and displace oxygen.</p>	<ul style="list-style-type: none"> • 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

Receptor	Description	Preventative and Mitigation Measures
Environment - emissions to water	<p>Causes - Cooling water blow-down. Laboratory waste (if included in the design). Maintenance waste, e.g., oils. Spills from batteries, coolant system, diesel trucks, transformers. Parked vehicles – oil drips. Fire water runoff control. Kitchen waste and sewage. Refrigerant release.</p> <p>Consequences - Pollution if not contained. Excessive disposal costs if emissions not limited.</p>	<ul style="list-style-type: none"> • Bunding under any outdoors tanks, curbing under truck offloading areas and sealed surfaces (e.g. concrete) under truck parking area is particularly important. • Sewage and any kitchen liquids - containment and suitable treatment/disposal. • Procedures for dealing with damaged/leaking equipment as well as clean-up of spills. • Normal site practices for preventing and containing diesel/paint etc spills. • Waste management plan to be in place e.g. liquid waste treatment or suitable removal and disposal will be provided. • Spill clean-up procedures to be in place before bringing container on site, including spill kits – non-combustible materials, hazmat disposal. • Reportable Quantities NEMA
Environment - emissions to earth	<p>Causes - Mess area and other solid waste. Disposal of solid-state batteries.</p> <p>Consequences - Environmental damage.</p>	<ul style="list-style-type: none"> • There will be packaging materials that will need to be disposed of after regular maintenance. • 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	<p>Causes - Similar to construction phase. Disposal of batteries or components. Disposal of containers. Water usage not controlled.</p> <p>Consequences - Delays. Excessive costs and disposal of large volumes of hazardous waste.</p>	<ul style="list-style-type: none"> • Water usage to be monitored on site. • Handling protocols to be provided by supplier of batteries. • Water management plan and spill containment plans to be in place. • Investigate end of Life plan for solid state batteries - reuse / recovery / reconditioning. • Similarly, for decommissioned containers – reuse / recovery / repurpose

Receptor	Description	Preventative and Mitigation Measures
Public - Aesthetics	Causes - Bright surfaces reflecting light. Tall structures in a flat area. Consequences - Irritation.	<ul style="list-style-type: none"> • Limited height for electrical infrastructure. • Sheeting likely to be painted, not left as reflective steel. • Confirm height limitations for electrical infrastructure, in terms of visual aspects. Visual impact assessment to include BESS installation when design details become available. • Containers single storey as physical space is not a constraint that would require stacking of containers. • Containers likely to be painted white, not left as reflective steel.
Investors - Financial	Causes - Defective technology. Extreme project delays. Consequences - Financial loss	<ul style="list-style-type: none"> • Design by experienced contractors using internationally recognized and proven technology. • Project management with deviation monitoring. Project insurance for construction phase. • Project insurance.
Employees and investors - Security	Causes - On route, potential hi-jacking of valuable but hazardous load. On site, theft of construction equipment and battery installation facilities. Civil unrest or violent strike by employees. Consequences - Theft. Injury to burglars. Damage to equipment possibly setting off thermal runaway.	<ul style="list-style-type: none"> • Fencing around electrical infrastructure to SANS standard and Eskom Guidelines. • Consider motion detection lights and CCTV. • The hazardous nature of the electrical and battery equipment should be clearly indicated – e.g., Skull and Cross Bones or other signs. • Isolated location both helps and hinders security. • 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. Consequences - Ransom of the National Electricity Grid.	<ul style="list-style-type: none"> • Cyber security needs monitoring. • Remote access to system needs to be negotiated and controlled. • Password controls, levels of authority etc. Protection of the National Electricity Grid from Cyber-attacks accessing through the BESS. • Cyber emergency procedures – should be in place prior to commissioning.

Receptor	Description	Preventative and Mitigation Measures
Emergencies	<p>Causes - Fires, explosions, toxic smoke, large spills, traffic accidents, equipment/structural collapse.</p> <p>Inadequate emergency response to small event leads to escalation.</p> <p>Consequences - Injuries turn to fatalities, small losses become extended down time.</p>	<ul style="list-style-type: none"> • All safety measures listed above. • Small events not handled correctly and escalate into larger events. Emergency procedures need to be practiced prior to commencement of operations. • Escape door open outwards, doors hooked open when persons inside. • More than one exit from buildings. • Storage of spare batteries (e.g., in stores on site or elsewhere) also needs to consider possible thermal run away.
Investors - Legal	<p>Causes Battery field is evolving quickly with new guides, codes and regulations happening at the same time as evolving technology.</p> <p>Consequences - Unknown hazards manifest due to using “cheaper supplier or less developed technology”.</p>	<ul style="list-style-type: none"> • Use only internationally reputable battery suppliers who comply with all known regulations/guideline at the time of purchasing. • Ensure only latest state of the art battery system are used.

8.2 General Specifications: Operational Phase

This section provides general actions and mitigation measures that should be followed directly after construction activities has ceased as well as during the operational phase of this project

Note: The ECO must monitor site clearance and be employed until rehabilitation measures have been completed

Site clearance after construction and rehabilitation

Impact management outcome: Ensuring proper site clean-up after construction has been completed and that rehabilitation is done according to specifications		
Mitigation / Management actions	Monitoring	Responsible for Implementation
<ul style="list-style-type: none"> After construction all building material, signs of excess concrete, equipment, site offices, ablution facilities, building rubble, refuse and litter must be removed and cleaned up from the construction site by the contractor. Items that can be used again should be recycled. Unusable waste steel and aluminium could be sold to scrap dealers for recycling. Once construction is completed, the Contractor has to obtain written consent from the EA Holder that the construction site, construction areas, access routes, etc. are sufficiently and adequately cleared. A Rehabilitation Plan must be compiled by a competent ecologist / landscape architect and must be implemented as stipulated. Rehabilitation of certain areas may take place during construction and the bulk of the rehabilitation will be after construction ends. 	<ul style="list-style-type: none"> The ECO must be permanently on site when site clearance takes place An agreement must be signed between the EA Holder and Contractor to confirm that the site has been properly cleared 	EA Holder Contractor

Cleaning of PV modules

Impact management outcome: Ensuring cleaning of the PV modules does not cause environmental pollution		
Mitigation / Management actions	Monitoring	Responsible for Implementation
<ul style="list-style-type: none"> Water for the cleaning of PV modules must be lawful and the use of rain water for this purpose is encouraged. Biodegradable cleaning materials should be used for washing purposes. Vegetation under the solar panels should not be removed, but rather brush cut where appropriate – removal of vegetation will cause erosion; Vegetation will also reduce dust, which will reduce cleaning requirements of the PV panels; “Dry” cleaning methods, such as dusting and sweeping the panels, should be used as far as possible to reduce water usage. 	Records of the PV panel washing schedule should be kept	On-site Project Manager O&M Manager EA Holder

Waste management

Impact management outcome:		
Mitigation / Management actions	Monitoring	Responsible for Implementation
<ul style="list-style-type: none"> • All hazardous waste used during the operation and maintenance of the solar facility must be disposed of at an approved and registered hazardous-waste landfill site. • Under NO circumstances may any hazardous waste be spoiled on the site; • Wind and scavenger proof bins must be and must be emptied as required – full and overflowing bins are not allowed • Vehicles may not be serviced on site; • Damaged PV modules should be stored in a designated area before being returned to supplier for recycling; • Vegetation cuttings may not be burned under any circumstance and can be utilised as mulch or as per the stipulations in the Rehabilitation Plan. 	Waste disposal certificates must be provided and kept on site (hazardous as well as general waste)	On-site Project Manager / Environmental Manager EA Holder

CHAPTER 9: DECOMMISSIONING PHASE

In the case of the proposed PV facility a decommissioning phase is likely to involve the disassembly and replacement of the existing components with more modern technology. This is likely to take place in the 20 - 28 years post commissioning. The most likely negative impact that will be associated with the replacement of old with new technology is the waste generated by the removal of the old solar panels and its associated structures.

The final decommissioning phase will have similar impacts and mitigation than the construction phase as assessed in this report and it will be possible to mitigate impacts to acceptable levels.

The decommissioning phase is likely to create additional, construction type jobs, as opposed to the jobs losses typically associated with decommissioning. This will be a positive impact.

The decommissioning phase will be addressed in full at that time by hand of the legislation relevant at that time..

10.1 Erosion

Soil erosion will need to be monitored visually by the onsite Environmental Manager / onsite Project Manager:

- Areas around roads, footpaths and PV panels must be visually monitored at least once per month during the rainy season.
- A photographic record of the on-site conditions must be taken during the above-mentioned site inspections.
- Signs of erosion should be remediated as soon as possible and the remedial efforts should be monitored regularly. Typical remediation techniques that could be followed are provided in Chapter 7, paragraph 7.3 above.

10.2 Ecological Monitoring

The following plans must be compiled when this EMPr is being updated and finalised:

- Plant rescue and protection plan
- Open space management plan
- Rehabilitation Plan / Habitat Restoration Plan
- Alien Invasive Management Plan

Any monitoring requirements stipulated in these plans must be included under this paragraph.

CHAPTER 10: CONCLUSION OF THE EMPR

PROJECT TEAM

This EMPr incorporated management actions and mitigation measures as stipulated in the impact assessments conducted by various specialists as well as actions included in engineering reports. Principles of best practice in terms of environmental management were also included.

The project team that contributed to this EMPr is provided under Section 1.6 of this EMPr.

AMENDMENTS TO THE EMPr

It is important to note that the EMPr should be seen as a 'living document' and changes to the EMPr may be made as required whilst retaining the underlying principles and management outcomes on which this document is based. Note that principles as per the NEMA EIA Regulations, Sections 35, 36 and 37, as amended, should be followed at all times, which may mean that the amended EMPr may have to be submitted for public review and approved by DFFE.
