LEEUWBOSCH PV GENERATION (PTY) LTD

Proposed Development of the 9.9MW Leeuwbosch 1 Solar Photovoltaic (PV) Plant and associated infrastructure near Leeudoringstad in the North West Province, Maquassi Hills Local Municipality Dr Kenneth Kaunda District Municipality

Draft Environmental Management Programme (EMPr)

NW DEDECT Ref No:	To be allocated
Issue Date:	11 June 2021
Revision No.:	1
Project No.:	15962

Date:	11 June 2021
Document Title:	Proposed Development of the 9.9MW Leeuwbosch 1 Solar Photovoltaic (PV) Plant and associated infrastructure near Leeudoringstad in the North West Province, Maquassi Hills Local Municipality Dr Kenneth Kaunda District Municipality: **Draft Environmental Management Programme (EMPr)**
Author:	**Mark Summers** M.Sc. Ecological Sciences (UKZN) **Stephan Jacobs** B.Sc. (Hons) Environmental Management & Analysis (UP) B.Sc. Environmental Sciences (UP)
Revision Number:	1
Checked by:	**Michelle Nevette – Divisional Manager** MEnvMgt. Environmental Management (UNISA)
Approved:	**Michelle Nevette – Divisional Manager** MEnvMgt. Environmental Management (UNISA)
Signature:	
For:	LEEUWBOSCH PV GENERATION (PTY) LTD

CONFIDENTIALITY STATEMENT

GLOSSARY OF TERMS

Construction Phase: The activities pertaining to the preparation for and the physical construction of the proposed development.

Contractor: Persons/organisations contracted by the Holder of the EA to carry out parts of the work for the proposed development.

Decommissioning Phase: Means to take out of active service permanently or dismantle partly or wholly, or closure of a facility to the extent that it cannot be readily recommissioned.

Engineer (E) / Project Manager (PM): Person / organisation appointed by the Holder of the EA to oversee the work of all consultants, sub-developers, contractors, residents and visitors.

Environmental Authorisation (EA): "the authorisation by a competent authority of a listed activity or specified activity in terms of section 24 of the National Environmental Management Act" (Act No. 107 of 1998) (NEMA).

Environmental Control Officer (ECO): Person / organisation appointed by the Holder of the EA who will provide direction to the Engineer/Project Manager concerning the activities within the Construction Zone, and who will be responsible for conducting the environmental audit of the project during the construction phase of the project according to the provisions of the Environmental Management Programme (EMPr).

Environmental Management Programme (EMPr): The EMPr is a detailed plan for the implementation of the mitigation measures to minimise negative environmental impacts during the life-cycle of a project. The EMPr contributes to the preparation of the contract documentation by developing clauses to which the contractor must adhere for the protection of the environment. The EMPr specifies how the construction of the project is to be carried out and includes the actions required for the Post-Construction/ Decommissioning Phase to ensure that all the environmental impacts are managed for the duration of the project's life-cycle.

Operational Phase (Post Construction): The period following the Construction Phase, during which the proposed development will be operational.

Pre-Construction Phase: The period prior to commencement of the Construction Phase, during which various activities associated with the preparation for the Construction Phase will be undertaken.

Rehabilitation: Rehabilitation is defined as the return of a disturbed area to a state which approximates the state (where possible) which it was in before disruption. Rehabilitation for the purposes of this specification is aimed at post-reinstatement re-vegetation of a disturbed area and the insurance of a stable land surface. Re-vegetation should aim to accelerate the natural succession processes so that the plant community develops in the desired way, i.e. promote rapid vegetation establishment.

Site Manager: The person, representing the Contractor, responsible for all the Contractor's activities on the site including supervision of the construction staff and activities associated with the Construction Phase. The Site Manager will liaise with the Project Manager in order to ensure that the project is conducted in accordance with the EMPr.

ABBREVIATIONS

AAA	- Astronomy Advantage Area
APM	- Archaeology, Palaeontology and Meteorites
ATNS	- Air Traffic and Navigation Services Company Limited
AIA	- Archaeological Impact Assessment
BA	- Basic Assessment
BLSA	- BirdLife South Africa
CAA	- Civil Aviation Act (Act No. 13 of 2009)
CARA	- Conservation of Agricultural Resources Act (Act No. 43 of 1983)
CBA	- Critical Biodiversity Area
CBD	- Convention on Biodiversity
DBAR	- Draft Basic Assessment Report
DEA	- Department of Environmental Affairs
DFFE	- Department of Forestry, Fisheries and Environment
DHSWS	- Department of Human Settlements, Water and Sanitation
DM	- District Municipality
DoE	- Department of Energy
DoI	- Declaration of Independence
DWS	- Department of Water and Sanitation
EAP	- Environmental Assessment Practitioner
ECA	- Environmental Conservation Act (ECA) (Act No. 73 of 1989)
ECO	- Environmental Control Officer
EHS	- Environmental, Health, and Safety
EIA	- Environmental Impact Assessment
EMPr	- Environmental Management Programme
EMS	- Environmental Management System
ERA	- The Electricity Regulation Act No. 4 of 2006
ESA	- Ecological Support Area
EAS	- Early Stone Ages
ESMP	- Environmental and Social Management Plan
ESMS	- Environmental and Social Management System
FBAR	- Final Basic Assessment Report
EHS	- Environmental, Health, and Safety
FSR	- Final Scoping Report
GA	- General Authorisation
GIS	- Geographic Information System
HIA	- Heritage Impact Assessment
I&AP(s)	- Interested and/or Affected Party/Parties
kV	- Kilo Volt
MW	- Megawatt
NEA	- The National Energy Act (Act No. 34 of 2008)
NEMA	- National Environmental Management Act (Act No. 107 of 1998)
NEM:AQA	- National Environmental Management: Air Quality Act (Act No. of 2004)
NEM:BA	- National Environmental Management: Biodiversity Act (Act No. 10 of 2004)

NEM:PAA - National Environmental Management: Protected Areas Act (Act No. 57 of 2003)
NEM:WA - National Environmental Management: Waste Act (Act No. 59 of 2008)
NFA - The National Forest Act (Act No. 84 of 1998)
NFEPA - National Freshwater Ecosystem Priority Areas
NHRA - National Heritage Resources Act (Act No. 25 of 1999)
NRTA - National Road Traffic Act (Act No. 93 of 1996)
NWA - National Water Act (Act No. 36 of 1998)
NW DEDECT - North West Department of Economic Development, Environment, Conservation and Tourism
NWPHRA - North West Provincial Heritage Resources Authority
OHSA - Occupational Health and Safety Act (Act No. 85 of 1993)
PPA - Power Purchase Agreement
PPP - Public Participation Process
PV - Photovoltaic
REDZ - Renewable Energy Development Zone
REIPPP - Renewable Energy Independent Power Producer Procurement Programme
RE - Renewable Energy
SA - South Africa
SACNASP - South African Council for Natural Scientific Professions
SACAA - South African Civil Aviation Authority
SALA - Subdivision of Agricultural Land Act (Act No. 70 of 1970)
SEF - Solar Energy Facility
SPVs - Special Purpose Vehicles
TOPs - Threatened or Protected Species
VIA - Visual Impact Assessment
WETFEPA - Wetland Freshwater Priority Areas
WEF - Wind Energy Facility
WMA - Water Management Area
WUL - Water Use License
WULA - Water Use License Application
ZoR - Zones of Regulation

CONTENTS

FIGURES

TABLES

LIST OF ANNEXURES

1 INTRODUCTION

Leeuwbosch PV Generation (Pty) Ltd (hereafter referred to as 'Leeuwbosch PV Generation') is proposing to construct a solar photovoltaic (PV) plant and associated infrastructure approximately 6 km north-east of the town of Leeudoringstad in the Maquassi Hills Local Municipality, which falls within the Dr Kenneth Kaunda District Municipality in the North West Province of South Africa (hereafter referred to as the 'proposed development') (**Figure 1**) (**Department Ref No.:** To be Allocated). The proposed development will have a total maximum generation capacity of up to approximately 9.9 megawatt (MW) and will be referred to as the Leeuwbosch 1 Solar PV Plant.

SiVEST Environmental Division (hereafter referred to as 'SiVEST') has subsequently been appointed as the independent Environmental Assessment Practitioner (EAP) to undertake the Basic Assessment (BA) process for the proposed construction of the Leeuwbosch 1 Solar PV Plant and associated infrastructure. The overall objective of the proposed development is to generate electricity (by capturing solar energy) to feed into the national electricity grid and 'wheel' the power to customers based on a Power Purchase Agreement (PPA).

It should be noted that this proposed solar PV development (this application) forms part of one (1) of four (4) solar PV plants and associated infrastructure (including on-site switching substations and 132 kilovolt (kV) overhead power lines) that are being proposed as part of a greater PV project near the town of Leeudoringstad in the North West Province, namely the Leeudoringstad Solar PV Project. In addition, one (1) 132/11kV on-site substation (namely the Leeudoringstad Solar Plant Substation) is also being proposed as part of the greater Leeudoringstad Solar PV Project.

The other proposed developments (solar PV, overhead power lines and 132/11kV on-site substation) which form part of the greater Leeudoringstad Solar PV project include the following:

- 9.9 MW Leeuwbosch 2 Solar PV Plant - **Reference Number:** To be Allocated (part of separate on-going BA process);
- 9.9 MW Wildebeestkuil 1 Solar PV Plant and 132kV Power Line - **Reference Number:** To be Allocated (part of separate on-going BA process);
- 9.9 MW Wildebeestkuil 2 Solar PV Plant and 132kV Power Line - **Reference Number:** To be Allocated (part of separate on-going BA process); and
- 132/11kV Leeudoringstad Solar Plant Substation - **Reference Number:** To be Allocated (part of separate on-going BA process).

The 132/11kV on-site substation (namely the Leeudoringstad Solar Plant Substation) is being proposed to feed the electricity generated by the proposed Leeuwbosch 1 Solar PV Plant into the national electricity grid. The 132/11kV Leeudoringstad Solar Plant Substation will however require a separate Environmental Authorisation (EA) and is subject to a separate BA process. In addition, 132kV overhead power lines are being proposed as part of the Wildebeestkuil 1 and Wildebeestkuil 2 Solar PV Plant BA processes (separate respective BA processes) and will be authorised under the Wildebeestkuil 1 and Wildebeestkuil 2 Solar PV Plant EAs respectively.

Although the solar PV plants (including 132kV overhead power lines which form part of Wildebeestkuil 1 and Wildebeestkuil 2 Solar PV Plant projects) and Leeudoringstad Solar Plant Substation will be assessed separately, a single public participation process is being undertaken to consider all of the proposed developments which form part of the greater Leeudoringstad Solar PV Project [i.e. four (4) solar PV plant BAs (including 2 132kV overhead power lines), and one (1) substation BA].

This Draft Environmental Management Programme (EMPr) has been compiled in line with the recommendations in the above-mentioned BA, and in terms of the requirements of Appendix 4 of the

National Environmental Management Act (Act No. 107 of 1998) [NEMA] Environmental Impact Assessment (EIA) Regulations, 2014 (as amended).

1.1 Project Team

SiVEST SA (Pty) Ltd has been appointed by Leeuwbosch PV Generation as the independent EAP to undertake the BA for the proposed construction of the 9.9MW Leeuwbosch 1 Solar PV Plant and associated infrastructure. As per the requirements of the EIA Regulations 2014 (as amended), the project team is provided in **Table 1** and the details and level of expertise of the persons who prepared the EMPr are provided in **Table 2** below.

Table 1: Project Team

Name	Organisation	Role
John Richardson	SiVEST SA (Pty) Ltd	Divisional Manager / Lead Project Coordinator
Michelle Nevette	SiVEST SA (Pty) Ltd	Divisional Manager / Project Coordinator / Project Review
Liandra Scott-Shaw*	SiVEST SA (Pty) Ltd	Previous Project Coordinator / Environmental Consultant
Stephan Jacobs	SiVEST SA (Pty) Ltd	Project Coordinator / Environmental Consultant
Kerry Schwartz	SiVEST SA (Pty) Ltd	Geographical Information Systems (GIS), Mapping and Visual**
Mark Summers	SiVEST SA (Pty) Ltd	Environmental Consultant and Visual**
Hlengiwe Ntuli	SiVEST SA (Pty) Ltd	Public Participation Consultant
Stephen Burton*	SiVEST SA (Pty) Ltd	Surface Water Specialist**
Garry Paterson	ARC	Agriculture & Soils Specialist
Chris Van Rooyen	Chris Van Rooyen Consulting	Avifauna (Birds) Specialist
Wouter Fourie	PGS	Heritage and Archaeology Specialist
Elize Butler	Banzai Environmental (Pty) Ltd	Palaeontology Specialist
Tsebo Majoro	Urban Econ Development Economists	Socio-Economic Specialist
Keval Singh	JG Afrika	Geotechnical Specialist
David Hoare	David Hoare Consulting	Terrestrial Ecology Specialist

**Individual no longer employed by SiVEST SA (Pty) Ltd.*

***Specialist assessments undertaken by SiVEST's in-house specialists.*

Table 2: Expertise of the EAP

Lead Project Coordinator	**SiVEST SA (Pty) Ltd – John Richardson**
Contact Details	johnr@sivest.co.za
Qualifications	BSc Hons (Geography and Environmental Management) – University of KwaZulu-Natal
Professional Affiliations	IAIAsa Membership Number: 2143
Expertise	John has approximately thirteen years' professional experience as an environmental scientist and GIS specialist in a range of environmental and strategic planning projects, processes and applications for private, government and commercial clients. Mr Richardson has experience in conducting Environmental Screening Assessments, Basic Assessment, Scoping and Full Environmental Impact Assessment, and Section

	24G compliance process under the 2006, 2010 & 2014 National Environmental Management: Environmental Impact Assessment Regulations, his experience includes Environmental Control Officer (ECO) site auditing duties and management of the GIS mapping requirements for several Biodiversity Sector Plans, Strategic Environmental Assessments, Environmental Management Frameworks and Strategic Environmental Management Plans. John prescribes to the International Association for Impact Assessment South Africa (IAIAsa) code of conduct and was between 2009-2014 a committee member of the KwaZulu-Natal branch. He was in August 2014 elected as the IAIAsa KwaZulu-Natal Branch Chairman and served as branch chairman for a two-year term. In August 2017 he was elected to serve on the IAIAsa National Executive Committee for a two-year term. John is currently in the process of registering with the Environmental Assessment Practitioners Association of South Africa (EAPASA).
Project Coordinator / Project Review	**SiVEST SA (Pty) Ltd – Michelle Nevette**
Contact Details	michellen@sivest.co.za
Qualifications	BA (Economics), Honours in Environmental Management MEnvMgt. (Environmental Management)
Professional Affiliations	▪ South African Council for Natural Scientific Professions (SACNASP): Cert.Nat.Sci. reg. No. 120356 ▪ IAIAsa member ▪ EAPASA No.2019/1560
Expertise	Michelle has expertise in Environmental Project Management and Environmental Impact Assessment. Michelle's strong managerial skills have been extensively used in setting up and running projects. She is responsible for the management of a team of environmental impact assessment practitioners, and on-going responsibilities on various environmental projects including review of processes and reports. Extensive experience in following the Basic Assessment and Environmental Impact procedure for a wide range of projects, as well as in preparing Environmental Management Plans, consulting with authorities and conducting Audits.
Project Coordinator / Environmental Consultant	**SiVEST SA (Pty) Ltd - Stephan Jacobs**
Contact Details	stephanj@sivest.co.za
Qualifications	B.Sc. Environmental Sciences (undergraduate) and B.Sc. (Hons) Environmental Management and Analysis
Professional Affiliations	IAIAsa Membership Number: 5736
Expertise	Stephan specialises in the field of Environmental Management and has vast experience undertaking EIA and BA processes for various types of projects / developments, in particular renewable energy projects / developments which form part of South Africa's Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) as well as the 2020 Risk Mitigation Independent Power Producer Procurement Programme (RMIPPPP). As such, Stephan has vast experience with regards to the compilation of EIA and BA reports. Additionally, Stephan has extensive experience in undertaking and facilitating public participation and stakeholder engagement processes. Stephan has also assisted extensively in the undertaking of field work and the compilation of reports for specialist studies such as Surface Water and Visual Impact Assessments. Stephan also has considerable experience in Environmental Compliance and Auditing and has acted as an ECO for several infrastructure projects.

Please refer to attached Curriculum Vitae (CV's) in **Appendix 1 of the Draft Basic Assessment Report (DBAR) and Annexure A in this EMPr** for more information. Declaration of Independence (DoI) for each respective specialist are contained in **Appendix 3 of the DBAR**.

2 LEGISLATIVE REQUIREMENTS

2.1 Applicable Legislation, Development Strategies and Guidelines

Several pieces of legislation and regulations will be applicable to the development of the project. These include:

- Constitution of South Africa
- National Environmental Management Act (NEMA) (Act No. 107 of 1998) – NEMA EIA Requirements
- NEMA EIA Regulations, 2014 (as amended)
- National Energy Act (NEA) (Act No. 34 of 2008)
- Electricity Regulation Act (ERA) (Act No. 4 of 2006, as amended)
- National Heritage Resources Act (NHRA) (Act No. 25 of 1999)
- National Water Act (NWA) (Act No. 36 of 1998, as amended)
- National Environmental Management: Biodiversity Act (NEM:BA) (Act No. 10 of 2004, as amended)
- National Environmental Management: Protected Areas Act (NEM: PAA) (Act No. 57 of 2003, as amended)
- National Forests Act (NFA) (Act No. 84 of 1998)
- Conservation of Agricultural Resources Act (CARA) (Act No. 43 of 1983)
- Subdivision of Agricultural Land Act (SALA) (Act No. 70 of 1970, as amended
- National Road Traffic Act (NRTA) (Act No. 93 of 1996, as amended)
- Civil Aviation Act (CAA) (Act No. 13 of 2009)
- Nature and Environmental Conservation Ordinance (NECO) 19 of 1974
- Astronomy Geographic Advantage Act (AGAA) (Act No. 21 of 2007)
- Renewable Energy Development Zones (REDZs)
- Occupational Health and Safety Act (OHSA) (Act No. 85 of 1993);
- Road Safety Act (RSA) (Act No. 93 of 1996);
- National Road Traffic Regulations Act (NRTA) (Act No. 22 of 2000);
- National Environmental Management: Air Quality Act (NEM:AQA) (Act No. 39 of 2004);
- National Environmental Management: Waste Act (NEM:WA) (Act No. 59 of 2008, as amended);
- NEM:BA, 2014 (Alien and Invasive Species Regulations, 2014).
- Development Facilitation Act (DFA) (Act No. 67 of 1995);
- The Hazardous Substances Act (HSA) (Act No. 15 of 1973);
- Water Services Act (WSA) (Act No. 108 of 1998);
- Municipal Systems Act (MSA) (Act No. 32 of 2000); and
- Mineral and Petroleum Resource Development Act (MPRDA) (Act No. 28 of 2002, as amended).

Refer to **Chapter 6** of the DBAR for a full overview of the legislation and applicability thereof.

Table 3: Compliance with National Environmental Management Act, 1998 (Act No. 107 of 1998) and Environmental Impact Regulations, 2014 (as amended) Content of Environmental Management Programmes (Appendix 4)

Requirements of Appendix 4 – GN R326 EIA Regulations of 7 April 2014 (as amended)	Section of Report
1. (1) An EMPr must comply with section 24N of the Act and include— (a) details of– (i) the EAP who prepared the EMPr; and (ii) the expertise of that EAP to prepare an EMPr, including a curriculum vitae;	Details of the EAP and full project team are in **Section 1.1** and CVs are included in **Annexure A** of this EMPr.
(b) a detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description;	Detailed descriptions of the aspects of the activities that are covered by the EMPr can be found in **section 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 should be avoided, including buffers;	This map can be found in **section 3.2.** It shows the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that should be avoided, including buffers;
(d) a description of the impact management outcomes, including management statements, identifying the impacts and risks that need to be avoided, managed and mitigated as identified through the environmental impact assessment process for all phases of the development including— (i) planning and design; (ii) pre-construction activities; (iii) construction activities; (iv) rehabilitation of the environment after construction and where applicable post closure; and (v) where relevant, operation activities;	Descriptions of the impact management outcomes, including management statements, identifying the impacts and risks that need to be avoided, managed and mitigated as identified through the environmental impact assessment process for all phases of the development can be found in **section 8.**
(f) a description of proposed impact management actions, identifying the manner in which the impact management outcomes contemplated in paragraph (d) will be achieved, and must, where applicable, include actions to — (i) avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation; (ii) comply with any prescribed environmental management standards or practices; (iii) comply with any applicable provisions of the Act regarding closure, where applicable; and (iv) comply with any provisions of the Act regarding financial provision for rehabilitation, where applicable;	Descriptions of proposed impact management actions, identifying the manner in which the impact management outcomes above are contemplated can be found in **section 8** and in **section 9.**

Requirements of Appendix 4 – GN R326 EIA Regulations of 7 April 2014 (as amended)	Section of Report
(g) the method of monitoring the implementation of the impact management actions contemplated in paragraph (f);	Refer to **section 8** and **section 9**, which outline high level monitoring methods.
(h) the frequency of monitoring the implementation of the impact management actions contemplated in paragraph (f);	Refer to **section 6.2** and **6.3**, as well as **section 8** and **section 9.** These sections outline high level monitoring methods including the frequency monitoring is to be implemented where relevant.
(i) an indication of the persons who will be responsible for the implementation of the impact management actions;	Refer to **section 7** which outlines the roles and responsibilities for the proposed solar PV plant.
(j) the time periods within which the impact management actions contemplated in paragraph (f) must be implemented;	Refer to **Section 6.2** and **6.3**, as well as **section 8** and **section 9,** which outline the time periods monitoring is to be implemented
(k) the mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f);	This EMPr, inclusive of Method statements, ensures compliance.
(l) a program for reporting on compliance, taking into account the requirements as prescribed by the Regulations;	This EMPr, inclusive of Method statements, ensures compliance.
(m) an environmental awareness plan describing the manner in which— (i) the applicant intends to inform his or her employees of any environmental risk which may result from their work; and (ii) risks must be dealt with in order to avoid pollution or the degradation of the environment; and	This plan can be found in **section 9.9** and addresses all risks associated with the proposed development.
(n) any specific information that may be required by the competent authority.	All high level plans that may be requested are included in **section 1**, as well as part of the Annexures.
(2) Where a government notice *gazetted* by the Minister provides for a generic EMPr, such generic EMPr as indicated in such notice will apply.	Noted.

3 PROJECT DETAILS

3.1 Technical Information Summary

The key technical details and infrastructure required are presented below:

Component	Description / Dimensions
Technology	Solar PV
Generation Capacity of Solar PV Plant	Maximum of up to approx. 9.9MW
Capacity of Switching Substation	More than 33kV but less than 275kV. Exact capacity of the proposed on-site switching substation will be determined and confirmed at a later stage.
Dimensions of PV Panels	▪ Width: up to approx. 1134mm (≈1.1m) ▪ Length: up to approx. 2274mm (≈2.3m)
Area of Application Site	Approximately 124.691ha
Area of PV Array	Approximately 23.211ha[1]
On-site Switching Substation	▪ One (1) new on-site switching substation with a capacity of more than 33 but less than 275kV. Exact capacity of the proposed on-site switching substation will be determined and confirmed at later stage; ▪ To connect proposed solar PV plant to 132/11kV Leeudoringstad Solar Plant Substation (part of separate BA process); ▪ Located within Portion 37 of the Farm Leeuwbosch No. 44; ▪ Total footprint: up to approx. 0.2003ha (i.e. 2 003m2); and ▪ To contain transformers for voltage step up from medium voltage to high voltage. DC power from the PV modules will be converted into AC power in the inverters and the voltage will be stepped up to medium voltage in the inverter transformers.
Guard House	▪ One (1) permanent guard house; and ▪ Total footprint: up to approx. 0.0876ha (i.e. 876m^2).
Temporary Building Zone	▪ One (1) temporary building zone; and ▪ Total footprint: up to approx. 0.2944ha (i.e. 2 944m2).
Area Occupied by Buildings	Up to approximately 1.3807ha (i.e. 13 807m^2)
Width of Existing Internal Gravel Roads	▪ Up to approx. 4m; and ▪ Existing internal gravel site roads will be used wherever possible. However, where required, new internal gravel roads may be constructed.
Length of existing internal roads (to be potentially upgraded)	▪ Up to approx. 1.57km; and ▪ Final lengths however to be confirmed once contractor has been selected and the design is finalised.
Site Access	Access to the proposed development (solar PV plant application site) will be via an existing gravel road which connects to the tarred R502 road.
Proximity to grid connection	**Although the on-site switching substation forms part of this application, the 132kV overhead power lines and 132/11kV Leeudoringstad Solar Plant Substation are not part of this Basic**

[1] Area where PV panels will be erected. It should be noted that although the PV array area will cover an area of up to approximately 23.211ha, the entire area will not be cleared as the PV panels only require small areas of vegetation to be cleared. It should be noted that less than 20ha of indigenous vegetation will ultimately be cleared.

Component	Description / Dimensions
	Assessment (BA), and are being applied for as part of separate respective BA processes. ▪ Grid connection is to the 132/11kV Leeudoringstad Solar Plant Substation, which is being applied for as part of a separate BA process; and ▪ The 132/11kV Leeudoringstad Solar Plant Substation is located within the proposed Leeuwbosch 1 Solar PV Plant application site (namely Portion 37 of the Farm Leeuwbosch No. 44).
Height of fencing	▪ Approx. 2.1m high; and ▪ Fencing will surround the entire proposed solar PV plant.
Type of fencing	Galvanised steel with electrification on top.
Area covered by fencing	Up to approximately 18ha
Boreholes and storage tanks	▪ At this stage it is anticipated that existing boreholes will be utilised; ▪ Water will potentially be stored in temporary water storage tanks. This will be confirmed throughout the BA process; and ▪ The necessary approvals from the Department of Water and Sanitation (DWS) will be applied for separately (should this be required).

The final design details of the proposed solar PV plant and associated infrastructure will become available during the detailed design phase of the proposed development, before construction commences.

3.2 Project Location

The proposed development is located approximately 6km north-east of the town of Leeudoringstad, within the Maquassi Hills Local Municipality in the Dr Kenneth Kaunda District Municipality of the North West Province of South Africa.

FARM DESCRIPTION	21 DIGIT SURVEYOR GENERAL (SG) CODE
Portion 37 of the Farm Leeuwbosch No. 44	T0HP00000000004400037

LEEUWBOSCH 1 SOLAR PV PLANT: APPLICATION SITE		
CORNER POINT COORDINATES (DD MM SS.sss)		
POINT	**SOUTH**	**EAST**
L_01 (NW)	S27° 12' 5.494"	E26° 17' 44.344"
L_02 (NE)	S27° 11' 44.632"	E26° 19' 2.500"
L_03 (S)	S27° 12' 39.532"	E26° 17' 58.463"
CENTRE POINT COORDINATES (DD MM SS.sss)		
POINT	**SOUTH**	**EAST**
CENTRE	S27° 12' 6.154"	E26° 18' 3.440"

LEEUWBOSCH 1 SOLAR PV PLANT: PV SITE AREA			
PHASE	**AREA (HECTARES)**	**CENTRE POINT COORDINATES**	
		SOUTH	**EAST**
SITE AREA	23.211[1]	S27° 12' 6.154"	E26° 18' 3.440"

*A full list of all corner point coordinates for the PV development area is provided in the DBAR (**Appendix 9A**).*

LEEUWBOSCH 1 SOLAR PV PLANT: SWITCHING SUBSTATION COORDINATES		
CENTRE POINT COORDINATES (DD MM SS.sss)		
POINT	**SOUTH**	**EAST**
CENTRE	S27° 12' 14.994"	E26° 18' 22.836"

On-site switching substation forms part of this proposed BA application.

LEEUWBOSCH 1 SOLAR PV PLANT: TEMPORARY BUILDING ZONE COORDINATES		
CENTRE POINT COORDINATES (DD MM SS.sss)		
POINT	**SOUTH**	**EAST**
CENTRE	S27° 12' 9.945"	E26° 18' 4.899"

LEEUWBOSCH 1 SOLAR PV PLANT: GUARD HOUSE COORDINATES		
CENTRE POINT COORDINATES (DD MM SS.sss)		
POINT	**SOUTH**	**EAST**
CENTRE	S27° 11' 58.772"	E26° 18' 25.359"

Refer to **Appendix 9A of the DBAR** for the full list of coordinates.

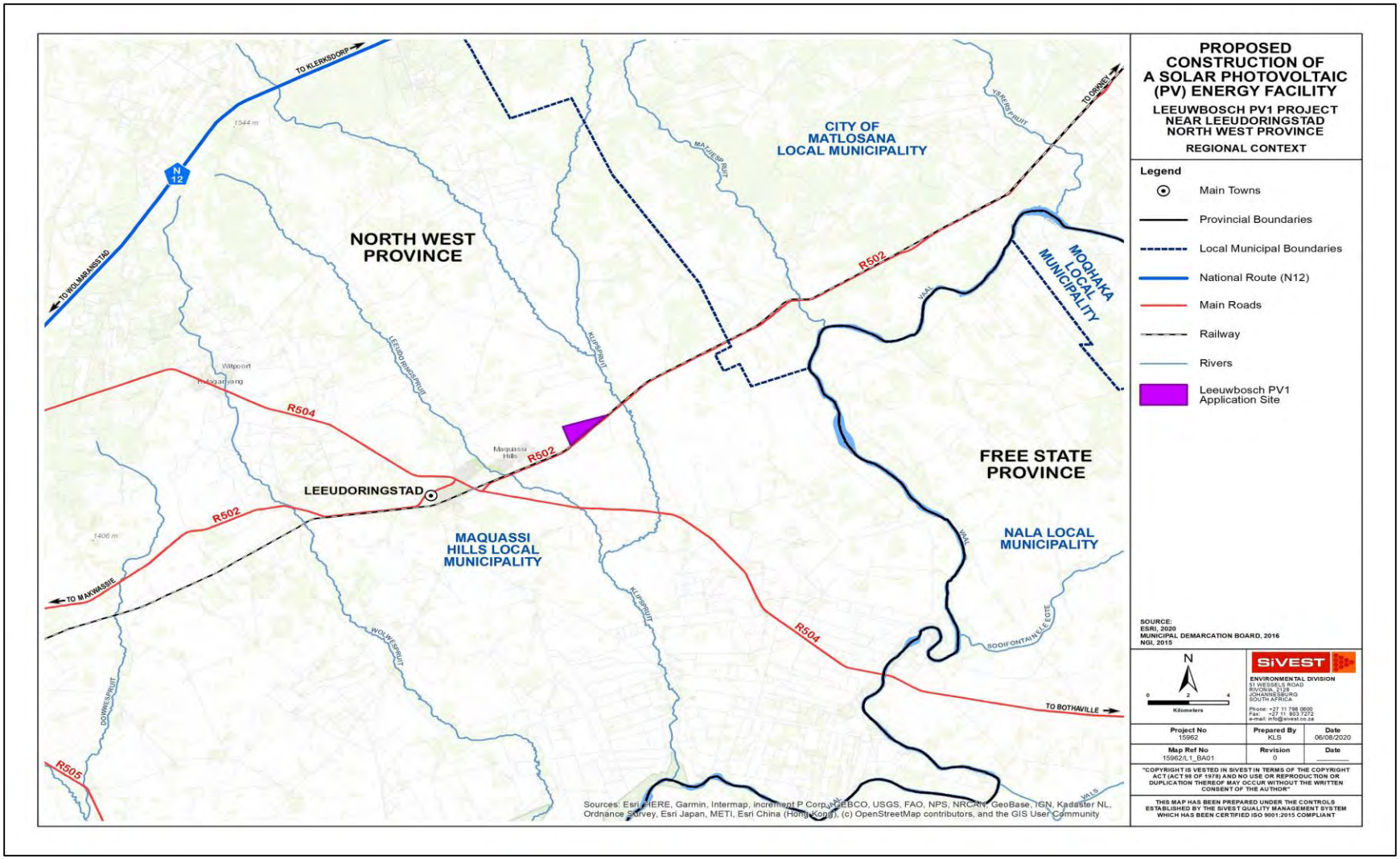


Figure 1: Regional Context Map indicating the Leeuwbosch 1 Solar PV Plant

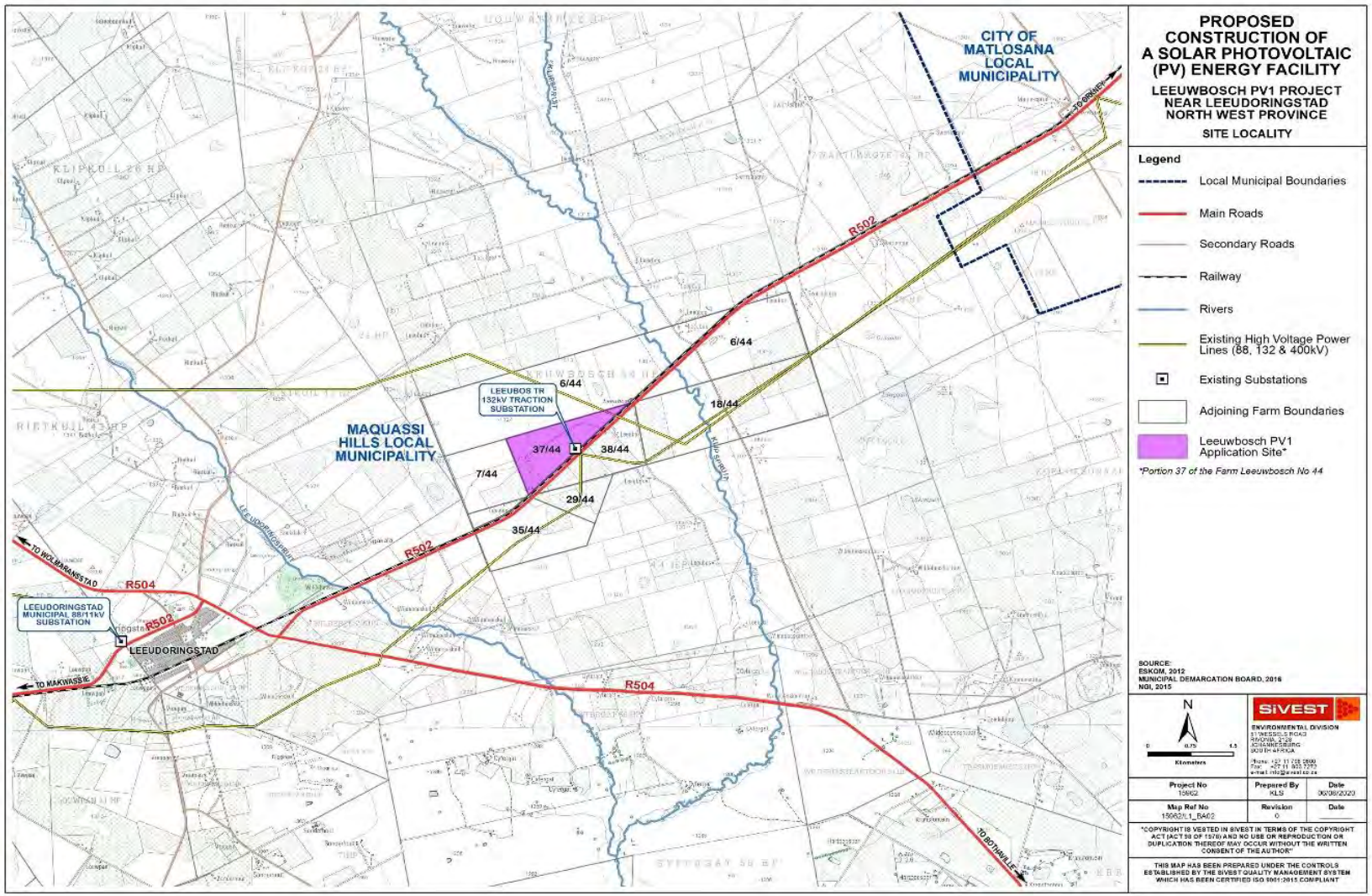


Figure 2: Site Locality Map

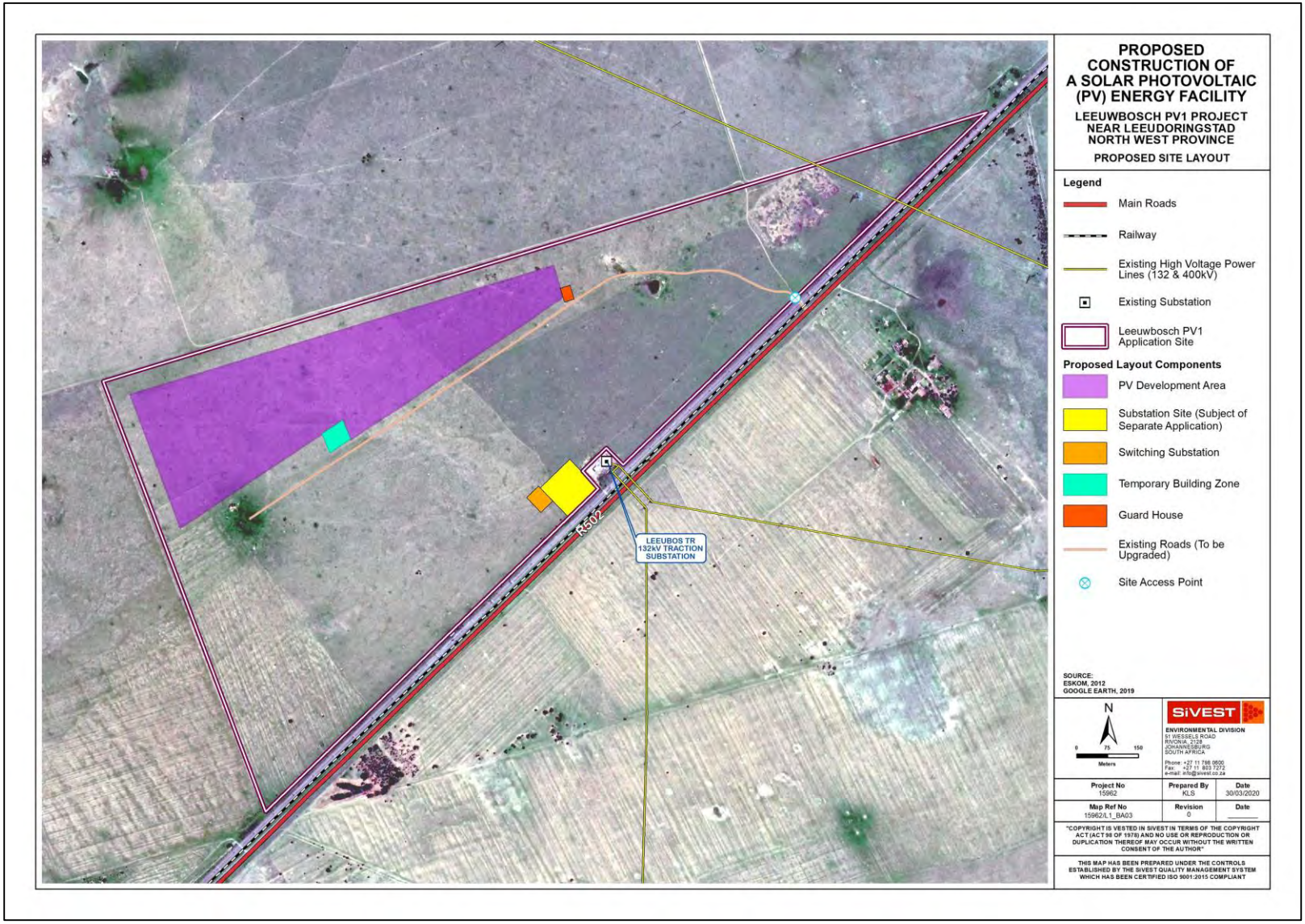


Figure 3: Proposed layout of the Leeuwbosch 1 Solar PV Plant.

The specialist sensitivities in conjunction with the proposed refined layout is mapped below:

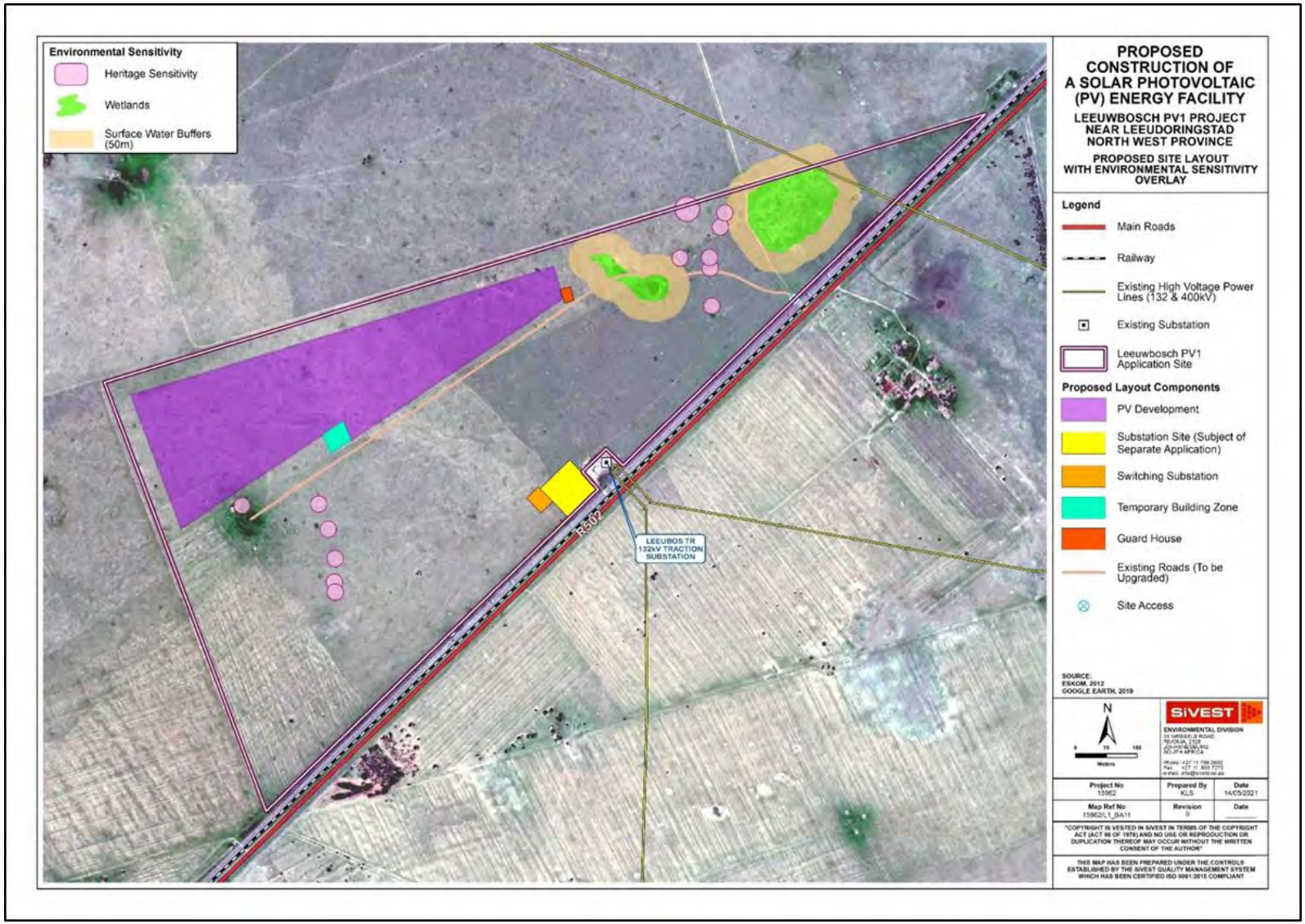


Figure 4: Map showing refined layout map with sensitivity data

3.3 Activities and Components associated with the Leeuwbosch 1 Solar PV Plant

Table 4: Activities associated with Planning, Construction, Operation and Decommissioning of the Leeuwbosch 1 Solar PV Plant

Phase/Activity	Description
Planning Phase	
Requirements	Conduct technical surveys prior to initiating construction.
Activities to be undertaken	
Requirements	▪ Project requires Environmental Authorisation (EA) from the North West Department of Economic Development, Environment, Conservation and Tourism (NW DEDECT). ▪ Electricity generated will be purchased by a second party, as part of a Power Purchase Agreement (PPA).
Conduct surveys	Including, but not limited to: a geotechnical survey, site survey and confirmation of the PV micro-siting footprint to confirm panel locations and all other associated infrastructure, including the on-site switching substation and permanent guard house.
Construction Phase	
Requirements	▪ Duration dependent on the number of PVs. Expected to be between 12 and 24 months for the Leeuwbosch 1 Solar PV Plant. ▪ At this stage it is anticipated that approximately 25 local persons will be employed during the development / construction phase. ▪ At this stage it is anticipated that approximately five (5) persons will be permanently employed during the operational phase. This includes cleaning, maintenance and security staff.
	No on-site labour camps anticipated. Anticipated that employees will be accommodated in the nearby town
	Overnight on-site worker presence would be limited to security staff.
	General waste will be collected and temporarily stockpiled in skips in a designated area on site and thereafter removed, emptied into trucks, and disposed at a registered waste disposal facility on a regular basis by an approved waste disposal Contractor (i.e. a suitable Contractor). Any hazardous waste (such as contaminated soil as a result of spillages) will be temporarily stockpiled (for less than 90 days) in a designated area on site (i.e. placed in leak-proof storage skips), and thereafter removed off site by a suitable service provider for safe disposal at a registered hazardous waste disposal facility. Waste disposal slips and waybills will be obtained for the collection and disposal of the general and hazardous waste. These disposal slips (i.e. safe disposal certificates) will be kept on file for auditing purposes as proof of disposal. The waste disposal facility selected will be suitable and able to receive the specified waste stream (i.e. hazardous waste will only be disposed of at a registered / licensed waste disposal facility). The details of the disposal facility will be finalised during the contracting process, prior to the commencement of construction.

Phase/Activity	Description
	Where possible, recycling and re-use of material will be encouraged. Waste management is further discussed in the EMPr. During the operational phase of the proposed Leeuwbosch 1 Solar PV Plant, waste generation will be minimal and will be disposed of a licensed landfill site.
	Electricity supply for the construction phase has not yet been determined. It is however likely that the developer will utilise a combination of generators and solar systems.
	At this stage it is anticipated that existing boreholes will be utilized for the construction phase. Water will potentially be stored in temporary water storage tanks. This will however be confirmed throughout the BA process. The necessary approvals from the Department of Water and Sanitation (DWS) will be applied for separately (should this be required). Approval for any additional water requirements will form part of a separate water use authorisation approvals process (if required).
Activities to be undertaken	
Conduct surveys prior to construction	Including, but not limited to: a geotechnical survey and site survey
Establishment of access roads to the Site	Access to the proposed solar PV plant application site will be via an existing gravel road which connects to the tarred R502 road.
	Access / haul roads and internal access roads within the site will be established at the commencement of construction (if required).
	Existing internal gravel site roads will be used to access the PV arrays as well as the switching substation, wherever possible. However, where required, new internal gravel roads may be constructed.
	Internal roads with a width of up to approx. 4m
Undertake site preparation	Include search and rescue of floral species of concern (where required) and the identification and excavation of any sites of cultural / heritage value (where required).
	Including the clearance of vegetation for establishment of the temporary building zone and the establishment of internal access roads and excavations for foundations.
	Stripping of topsoil to be stockpiled, backfilled, removed from site and/or spread on site.
	To be undertaken in a systematic manner to reduce the risk of exposed ground being subjected erosion.
Establishment of laydown areas and batching plant on site	A laydown area / temporary building zone for the storage of PV components, including civil engineering construction equipment, total footprint to be confirmed at site establishment.
	The laydown area will also accommodate building materials and equipment associated with the construction of buildings.
	At this stage it is not anticipated that borrow pits will be required. Infilling or depositing materials will be sourced from licenced borrow pits within the surrounding areas.
	A temporary concrete batching plant to facilitate the concrete requirements for foundations.

Phase/Activity	Description
Transport of components and equipment to and within the site	PV units to be transported includes the mounts
	Transportation will take place via appropriate National and Provincial roads, and the dedicated access / haul road to the site.
	Components considered as abnormal loads in terms of Road Traffic Act (Act No 29 of 1989) due to dimensional limitations and load limitations and will require a permit for the transportation of the abnormal loads on public roads.
	Civil engineering construction equipment to be brought to the site for the civil works (e.g. excavators, trucks, graders, compaction equipment, cement trucks, site offices etc.).
	Components for the establishment of the on-site switching substation (including transformers) and the associated infrastructure to be transported to site.
Construction of PV fields (arrays) / multiple PV modules	Lifting cranes will be used and are required to move between the array sites
Construction of on-site switching substation	One (1) on-site switching substations to be constructed within the development footprint.
	On-site switching substation will occupy an area of up to approximately 0.2ha.
Connection of PV fields (arrays) to the substation	PV field (array) to be connected to the on-site switching substation via underground electrical cables
	Excavation of trenches are required for the installation of the cables. Trenches anticipated to be approximately 0.8m x 0.6m wide at this stage.
	Underground cables are planned to follow the internal access roads, as far as possible.
Establishment of ancillary infrastructure	A workshop, contractor's equipment camp, temporary storage areas and a construction compound will be required.
	Service buildings for site offices, storage and safe re-fueling areas are also required.
	Establishment will require the clearing of vegetation, levelling and the excavation of foundations prior to construction.
Connect on-site switching substation to the power grid	On-site switching substation to connect the Leeuwbosch 1 Solar PV Plant to the 132/11kV Leeudoringstad Solar Plant Substation (part of separate BA process)
	Connection via 132/11kV Leeudoringstad Solar Plant Substation (to be undertaken as a separate BA process) in order to evacuate the generated electricity.
Undertake site rehabilitation	Commence with rehabilitation efforts once construction is completed in an area, and all construction equipment is removed.
	On commissioning, access points to the site that will not be required for the operation phase will be closed and prepared for rehabilitation.
Operation Phase	
Requirements	Duration will be approximately 20 years, depending on the length of the power purchase agreement with the relevant off taker.
	Requirements for security and maintenance of the facility.
	Employment opportunities relating mainly to operation activities and maintenance. At this stage it is anticipated that approximately five (5) persons will be permanently employed during the operational phase. This includes cleaning, maintenance and security staff..

Phase/Activity	Description
	Current land-use activities, i.e. farming activities, being undertaken within the project site can continue during the operation of the solar PV plant.
Activities to be undertaken	
Operation and Maintenance	Full time security, maintenance and control room staff.
	All PV fields (arrays) comprising multiple PV modules will be operational, except under circumstances of mechanical breakdown, inclement weather conditions, or maintenance activities.
	Modules to be subject to periodic maintenance (washing etc.) and inspection.
	Disposal of waste products (e.g. oil) in accordance with relevant waste management legislation.
	Areas which were disturbed during the construction phase to be utilized, should a laydown area be required during operation.
Decommissioning Phase	
Requirements	Decommissioning of the Leeuwbosch 1 Solar PV Plant infrastructure at the end of its economic life.
	Potential for re-powering of the facility, depending on the condition of the facility at the time.
	Expected lifespan of approximately 20 years (with maintenance) (depending on the length of the power purchase agreement with the relevant off taker) before decommissioning is required.
	Decommissioning activities to comply with the legislation relevant at the time.
Activities to be undertaken	
Site preparation	Confirming the integrity of site access to accommodate the required equipment
	Preparation of the site (e.g. laydown areas).
	Mobilisation of decommissioning equipment.
Disassemble and remove PV fields (arrays) / multiple PV modules	Large crane required for the disassembling of the PV panels and associated infrastructure
	Components to be reused, recycled, or disposed of in accordance with regulatory requirements.
	Majority of components of the PV fields (arrays) / multiple PV modules would be considered re-usable or recyclable
	Any concrete will be removed to a depth as defined by an agricultural and geotechnical specialists and the area rehabilitated
	Cables will be excavated and removed, as may be required.
Components to be disposed of or recycled.	Foundation
	PV Modules / panels
	Mounts
	Electrical components

4 PURPOSE AND OBJECTIVES OF THE EMPr

An EMPr is defined as "*an environmental management tool used to ensure that undue or reasonably avoidable adverse impacts of the construction, operation and decommissioning of a project are prevented or mitigated, and that the positive benefits of the projects are enhanced*".

The objectives of this EMPr are to:

- Identify a range of mitigation measures which could reduce and mitigate the potential impacts to minimal or insignificant levels;
- To identify measures that could optimise beneficial impacts;
- To create management structures that address the concerns and complaints of I&APs with regards to the development;
- To establish a method of monitoring and auditing environmental management practices during all phases of development;
- Ensure that the construction and operational phases of the project continues within the principles of Integrated Environmental Management and Environmental Management System (EMS) ISO 14001 Principles;
- Detail specific actions deemed necessary to assist in mitigating the environmental impact of the project;
- Makes sure that the safety recommendations are complied with;
- Propose mechanisms for monitoring compliance with the EMPr and reporting thereon; and
- Specify time periods within which the measures contemplated in the EMPr are implemented, where appropriate.

The EMPr Seeks to highlight the following:

- Avoiding impacts by not performing certain actions;
- Minimising impacts by limiting aspects of an action;
- Rectifying impacts through rehabilitation, restoration, etc. of the affected environment;
- Compensating for impacts by providing substitute resources or environments;
- Minimising impacts by optimising processes, structural elements and other design features;
- Provide ongoing monitoring and management of environmental impacts of a development and documenting of any digressions /good performances; and
- The EMPr is a legally binding document that all parties involved in the project must be made aware of.

5 STRUCTURE OF THE EMPr

5.1 Introduction

This EMPr addresses both generic issues as well as specific issues. The generic and specific issues are each separated into different phases. Each phase has specific issues unique to that period of the development and operation of the solar energy facility as well as associated infrastructure. The impact is identified and given a brief description. The phases of the development are identified as below:

- Planning and design phase
- Construction (including associated rehabilitation of affected environment)
- Operation Phase
- Decommissioning

This EMPr seeks to manage and keep to a minimum the negative impacts of a development and at the same time, enhance the positive and beneficial impacts. The EMPr specifies mitigation measures for the following environmental aspects:

5.2 Planning and Design Phase

- Site Preparation
- Documentation
- Consultation
- Site clearing

5.3 Construction Phase

- Construction Camp
- Environmental Education and Training
- Erosion Control
- Storm Water Management
- Water Use and Quality
- Waste Management
- Flora
- Fauna
- Avifauna
- Air Quality
- Soils and Geology
- Agriculture
- Noise and Vibrations
- Visual Impact
- Heritage, Archaeological, Palaeontological and Cultural Landscape
- Social Environment
- Construction Traffic and Access
- Energy Use
- Employment
- Security

5.4 Operation Phase

- Rehabilitation and Maintenance and Biodiversity
- Operation and Maintenance
- Storm water Management
- Flora
- Fauna
- Avifauna
- Air Quality
- Aquatic Ecology
- Agriculture
- Geotechnical
- Visual Impact
- Glint and Glare Impacts
- Heritage, Archaeological, Palaeontological and Cultural Landscape
- Social Environment

5.5 Decommissioning Phase

- Ongoing Stakeholder involvement
- Construction site Decommissioning
- Community health and safety
- Waste Management
- Biodiversity
- Aquatic Ecology
- Agriculture
- Geotechnical
- Visual Impact
- Air Quality
- Heritage, Archaeological, Palaeontological and Cultural Landscape
- Social Environment
- Transportation

6 ENVIRONMENTAL COMPLIANCE

6.1 Compliance with the EMPr

The Contractor/s is/are deemed not to have complied with the EMPr if:

- Within the boundaries of the site, site extensions and access roads there is evidence of contravention of clauses;
- If environmental damage ensues due to negligence;
- The contractor fails to comply with corrective or other instructions issued by the ECO or Authorities within a specified time;
- The Contractor fails to respond adequately to complaints from the public; and
- Contravention of or deviation from any condition stipulated in the EA.

The Holder of the EA is deemed not to have complied with the EMPr if:

- Within the construction footprint there is evidence of contravention of clauses;
- If environmental damage ensues due to negligence or failure to implement conditions of the EMPr;
- They fail to respond adequately to complaints from the public; and
- Contravention of or deviation from any condition stipulated in the EA.

6.1.1 Environmental Emergency Response

The Contractor's environmental emergency procedures must ensure that there will be an appropriate response to unexpected or accidental actions or incidents that could cause environmental impacts. Such incidents may include but are not limited to:

- Accidental discharges to water (i.e. into a water resource) and land;
- Accidental spillage of hazardous substances (typically oil, petrol, and diesel);
- Accidental toxic emissions into the air;
- Specific environmental and ecosystem effects from accidental releases or incidents;

The Environmental Emergency Response Plan is separate to the Health and Safety Plan as it is aimed at responding to environmental incidents and must ensure and include the following:

- Construction employees must be adequately trained in terms of incidents and emergency situations;
- Details of the organisation (manpower) and responsibilities, accountability and liability of personnel;
- A list of key personnel and contact numbers;
- Details of emergency services (e.g. the fire department, spill cleanup services) must be listed;
- Internal and external communication plans, including prescribed reporting procedures;
- Actions to be taken in the event of different types of emergencies;
- Incident recording, progress reporting and remediation measures to be implemented; and
- Information on hazardous materials, including the potential impact associated with each, and measures to be taken in the event of accidental release.

The Contractor(s) will comply with the environmental emergency preparedness and incident and accident-reporting requirements, as required by the Occupational Health and Safety Act (Act No. 85 of 1993), the

National Environmental Management Act (Act No. 107 of 1998), the National Water Act (Act No. 36 of 1998), and/or any other relevant legislation.

6.1.2 Non- compliance

Non-conformance will be issued to the Contractor for incidents of non-compliance. The Contractor (through the Environmental Officer) must also take the necessary steps (e.g. training) to prevent a recurrence of the infringement. The Contractor is also advised that the imposition of non-conformance does not replace any legal proceedings the authorities, landowners and/or members of the public may institute against the Contractor. The Contractor must be required to make good any damage caused as a result of the infringement at his own expense. A preliminary list of infringements for which non-conformance will be imposed is as follows:

- Using areas outside the working areas without permission/accessing “no-go areas”;
- Clearing and/or leveling area outside of the working areas;
- Littering on the site and surrounds;
- Burying/burning waste on site and surrounds;
- The undertaking of informal ablutions
- Making fires on site;
- Spillage onto the ground or water bodies of oil, diesel, or any other potential pollutants;
- Picking/damaging plant material, especially that from the residual areas of natural bush on the site;
- Damaging/killing wild or domestic animals/birds;
- Discharging effluent and/or storm water onto the ground or into surface water;
- Repeated contravention of the specification or failure to comply with instruction;
- Mixing cement directly on soil or bare ground outside designated batching plant; and
- Keeping animals as pets on site.

The Senior Site Supervisor, on recommendation from the ECO, may also order the Contractor to suspend part or all the works if the Contractor repeatedly causes damage to the environment by not adhering to the EMPr (i.e. more than 3 cases of infringements). The suspension will be enforced until such time as the offending actions, procedure or equipment is corrected. No extension of time will be granted for such delays and all costs will be borne by the Contractor.

Penalty Fines

Where environmental damage is caused or a pollution incident, and/or failure to comply with any of the environmental specifications contained in the EMPr, the Contractor shall be liable to pay a penalty fine. The following transgressions, as a minimum, should be penalised:

- Hazardous chemical / oil spill;
- Damage to sensitive environments;
- Damage to cultural and historical sites;
- Unauthorised removal / damage to indigenous trees and other vegetation, particularly in identified sensitive areas;
- Uncontrolled / unmanaged erosion;
- Unauthorised blasting activities; and
- Violation of environmental authorisation conditions.

Spot Fines

The following transgressions, as a minimum, should be fined:

- Littering on site;
- Lighting of illegal fires on site;
- Any persons, vehicles or equipment related to the contractor's operations found within the designated 'no-go' areas (especially for significant cultural resources such as nearby graves etc.);
- Creating dust or noise;
- Possession or use of intoxicating substances or weapons on site;
- Trapping, hunting or trading of fauna and / or plants on site;
- Any vehicles being driven in excess of designated speed limits;
- Unauthorised removal and/or damage to fauna, flora or cultural or heritage objects on site; and
- Urination and defecation anywhere other than using the toilet facilities that have been provided.

These activities, along with the appropriate guidelines to determining the fines, shall be agreed to by Leeuwbosch PV Generation, the Project Manager and the Contractor. Such fines will be issued in addition to any remedial costs incurred as a result of non-compliance with the environmental specifications and or legal obligations. Leeuwbosch PV Generation will inform the contractor of the contravention and the amount of the fine.

6.1.3 Training and Awareness

The Main Contractor is to take responsibility for the management of their staff and subcontractors on the project site during the construction and decommissioning phase and supervise them closely at all times. The onus is on the Contractor to make sure that all their staff and subcontractors fully comprehend the contents of the EMPr. The Contractor must organise environmental awareness training programmes, which should, be targeted at the two (2) levels of employment: management and labour.

6.1.4 Training of Construction Workers

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

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

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

- Acceptable behaviour with regard to flora and fauna;
- Management and minimising of waste, including waste separation;
- Maintenance of equipment to prevent the accidental discharge or spill of fuel, oil, lubricants, cement, mortar and other chemicals;

- Responsible handling of chemicals and spills;
- Environmental emergency procedures and incident reporting; and
- General code of conduct towards I&APs.

The ECO may be requested to provide additional training (in a first language) on-site regarding environmental aspects that are unclear to the construction personnel. A translator may be required and requested to assist in this additional training. The cost for the translator will be borne by the Contractor.

6.1.5 Contractor Performance

The Main Contractor must ensure that the conditions of the EMPr are adhered to. Should the Main Contractor require clarity on any aspect of the EMPr, the Main Contractor must contact the ECO for advice.

6.2 Environmental Monitoring

A monitoring programme must be implemented for the duration of the lifecycle of proposed development.

Frequency of monitoring the implementation of the impact management actions is as follows:

- Monthly Audits During the Construction Phase
- Adhoc audits as required - according to the EMPr, EA and permit conditions which will be conducted by the ECO. These audits can be conducted randomly and do not require prior arrangement with the project manager.
- Audits conducted during the Operational Phase as required
- Compilation of an audit report reporting on compliance with the EMPr. This report will be submitted to the relevant authorities.

The ECO must keep a photographic record of any damage to areas outside the demarcated site area. The date, time of damage, type of damage and reason for the damage must be recorded in full to ensure the responsible party is held liable. A register must be kept of all complaints from the landowners and /or community. All complaints / claims must be handled immediately to ensure timeous rectification / payment by the responsible party.

The EMPr will be made binding on all contractors operating on the site and must be included within the Contractual Clauses. Those responsible for environmental damage must pay the repair costs both to the environment and human health and the preventative measures to reduce or prevent further pollution and/or environmental damage (the polluter pays principle).

6.3 Monitoring System (all phases)

Table 5: Monitoring System (all phases)

MONITORING SYSTEM	
MITIGATION MEASURES	1. Monitoring must be undertaken to evaluate the success of mitigation measures. Monitoring methods must be in accordance with features that need to be monitored. 2. An area for the storage of hazardous materials must be established that conforms to the relevant safety requirements and provides for spillage prevention and containment.

MONITORING SYSTEM	
	3. Environmental awareness training for construction staff, concerning the prevention of accidental spillage of hazardous chemicals and oil; pollution of water resources (both surface and groundwater), air pollution and litter control. 4. Spillage packs must be available at construction areas. 5. Proper storage facilities for the storage of oils, paints, grease, fuels, chemicals and any hazardous materials to be used must be provided to prevent the migration of spillage into the ground and groundwater regime around the temporary storage area(s). These pollution prevention measures for storage must include a bund wall high enough to contain at least 110% of any stored volume, and this must be sited away from drainage lines in a site with the approval of the Project Manager. The bund wall must be high enough to contain 110% of the total volume of the stored hazardous material with an additional allocation for potential storm water events. 6. These storage facilities (including any tanks) must be on an impermeable surface that is protected from the ingress of storm water from surrounding areas in order to ensure that accidental spillage does not pollute local soil or water resources. 7. An approved waste disposal contractor must be employed to remove and recycle waste oil, if practical. The contractor must ensure that its staff is made aware of the health risks associated with any hazardous substances used and has been provided with the appropriate protective clothing/equipment in case of spillages or accidents and have received the necessary training. 8. Where contamination of soil is expected, analysis must be done prior to disposal of soil to determine the appropriate disposal route. Proof from an approved waste disposal site where contaminated soils are dumped if and when a spillage / leakage occur must be attained and given to the project manager. 9. Topsoil and subsoil to be protected from contamination. This must be monitored on a monthly basis by a visual inspection of diesel/oil spillage and pollution prevention facilities. 10. Concrete and chemicals must be mixed on an impervious surface and provisions must be made to contain spillages or overflows into the soil. 11. Relevant departments and other emergency services must be contacted in order to deal with spillages and contamination of aquatic environments. 12. Soils must be kept free of petrochemical solutions that must be kept on site during construction. Spillage can result in a loss of soil functionality thus limiting the re-establishment of flora.

7 DUTIES OF ROLE PLAYERS

The table below provides a summary of the proposed duties of role players.

Table 6: Responsible Parties and Auditing Process

TITLE	PARTY	PROJECT DUTIES
Holder of the EA / Developer	Leeuwbosch PV Generation (Pty) Ltd (Holder of EA)	• Assume ultimate responsibility. • Complies with all applicable legislation and is conversant with the requirements of the Environmental Management Programme (EMPr). • Assesses all activities requiring special attention as specified and/or requested by the E for the duration of the Contract. • Ensures that the Contractor conducts all activities in a manner that minimises disturbance to directly affected residents and the public in general, as advised by the E. • May, on the recommendation of the E and/or the ECO, through the Principle Agent order the Contractor to suspend any or all works on site if the Contractor or his sub-contractor / supplier fail to comply with the said environmental specifications.
Project Manager / Engineer (E)	To be appointed by Holder of the EA	• Complies with all applicable legislation and is conversant with the requirements of the EMPr. • Arranges information meetings for and consults with I&AP's about the impending construction activities. • Maintains a register of complaints and queries by members of the public at the site office. • Enforces and monitors compliance the requirements of the EMPr on site. • Assesses the Contractor's environmental performance in consultation with the ECO. • Documents in conjunction with the Contractor, the state of the site prior to construction activities commencing.
Main Contractor(s)	There will be multiple contracts placed. These may cover civil earthworks and concrete, structural mechanical and electrical / instrumentation.	Main Contractor will undertake day to day construction activities covering aspects such as civil earthworks and concrete, structural mechanical and electrical / instrumentation. • Complies with all applicable legislation, is conversant with the requirements of the EMPr, and briefs staff about the requirements of same. • Ensures any sub-contractors / suppliers who are utilised within the context of the contract comply with the environmental requirements of the EMPr. The Contractor will be held responsible for non-compliance on their behalf. • Supplies method statements for all activities requiring special attention as specified and/or requested by the E or ECO during the duration of the Contract. • Provides environmental awareness training to staff. • Bears the costs of any damages / compensation resulting from non-

TITLE	PARTY	PROJECT DUTIES
		adherence to the EMPr or written site instructions. • Conducts all activities in a manner that minimises disturbance to directly affected residents and the public in general, and foreseeable impacts on the environment. • Ensures that the E is timeously informed of any foreseeable activities that will require input from the ECO.
Environmental Officer (EO)	To be appointed by Main Contractors	• Day to day environmental responsibility, point of contact for ECO
Environmental Control Officer (ECO)	To be appointed by Holder of the EA	• Monthly audits • Briefs the Contractor about the requirements of the Environmental Specification and/or EMPr, as applicable. • Advises the E about the interpretation, implementation and enforcement of the Environmental Specification and other related environmental matters. • Monitors and report on the performance of the contractor / project in terms of environmental compliance with the EMPr to the E and Developer. • Provides technical advice relating to environmental issues to the E.

Unless otherwise stated, the EMPr will be adhered to as follows:

- The EO will be the responsible party for all daily compliance of this EMPr during the construction phase;
- The monitoring party will be the ECO;
- Method of record keeping will be monthly audits undertaken by the ECO; and
- Audit Technique will be the review of records and documentation (including EMPr / EA / permits) that will be kept on site by the EO and/or site inspections.
- The Holder of the EA will bear ultimate responsibility during the construction, operational and decommissioning phase.

8 MANAGEMENT PROGRAMME

8.1 Planning and Design Phase

- Makes sure that the design of the solar PV plant responds to the identified environmental constraints and opportunities.
- Makes sure that pre-construction activities are undertaken in accordance with all relevant legislative requirements.
- Makes sure that adequate regard has been taken of identified environmental sensitivities, as well as any landowner and community concerns and that these are appropriately addressed through design and planning (where applicable).
- Permits construction activities to be undertaken without significant disruption to other land uses and activities in the area.
- Makes sure that the best environmental options are selected for the solar PV plant.
- The EMPr specifies mitigation measures for the following environmental aspects:
    - Site Preparation
    - Consultation
    - Site clearing

8.1.1 Site Preparation

This section deals with the preparation of the site and actions that need to be implemented before construction commences.

Table 7: Site preparation

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
Site preparation: Appoint construction team and suitable manager	1. Carefully plan to minimize the construction period and avoid construction delays. 2. Appoint an ECO and EO. The EO is appointed on the contractor's behalf while the ECO is appointed on the Holder of the Environmental Authorisation's (EA's) behalf. 3. The Contractor must draw up method statements for relevant construction activities. The ECO must approve all of the method statements before they become operational.	Holder of the EA	Avoid construction delays. Ensure the EMPr is adhered to.
Site preparation: Site demarcation	1. All Construction Camp(s) are to be fenced off in such a manner that unlawful entry is prevented and access is controlled. Signage must be erected at all access points in compliance with all applicable occupational health and safety requirements. All access points to the Construction Camp	Holder of the EA	Ensure safety of the public and prevent loss/ damage equipment. Ensure the conditions of the EA are adhered to.

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
and compliance	must be controlled by a guard or otherwise monitored, to prevent unlawful access. 2. Increase permeability of the fences to medium-to-small wildlife and wildlife-friendly designs. 3. The contractor and ECO must ensure compliance with conditions described in the EA. 4. Records of compliance / non-compliance with the conditions of the authorisation must be kept and be available on request. 5. Records of all environmental incidents must be maintained and a copy of these records be made available to provincial department on request throughout the project execution. 6. A suitable licensed landfill site must be identified, which will accept the type of waste material to be generated. 7. All waybills and disposal slips (e.g. safe disposal certificates, waste manifests) must be retained for a minimum period of five (5) years for the disposal activities associated with the construction and decommissioning of the proposed facility, per regulation 8(1) of the NEM:WA, 2008 Waste Classification and Management Regulations published in GN No. R. 634 of 23 August 2013. 8. Where new water course crossings are required, the engineering team must provide an effective means to minimise the potential upstream and downstream effects of sedimentation and erosion (erosion protection) as well minimise the loss of riparian vegetation (reduce footprint as much as possible).		Compliance to all legislative requirements.
Site preparation: Labour	1. All unskilled labourers must be drawn from the local market and where possible use must be made of local semi-skilled and skilled personnel where possible.	Holder of the EA	Fair employment practices in place Maintain a locals first recruitment policy as far as possible, reduced social impact from development
Site preparation:	1. Environmental awareness training for construction staff, concerning the prevention of accidental spillage of hazardous	Holder of the EA	All staff members are aware of the EMPr requirements relevant to them

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
Training of site staff	chemicals and oil; pollution of water resources (both surface and groundwater), air pollution and litter control and identification of archaeological artefacts. 2. In the event of a significant spill or leak of hazardous substances (e.g. petrol and diesel), such incident(s) must be reported to all relevant authorities, including the NW DEDECT in accordance with section 30(1)(c) of the NEMA, 1998 pertaining to the control of incidents. 3. Project Manager must ensure that the training and capabilities of the Contractor's site staff are adequate to carry out the designated tasks. 4. Staff operating equipment (such as loaders, etc.) must be adequately trained and sensitised to any potential hazards associated with their tasks. 5. No operator must be permitted to operate critical items of mechanical equipment without having been trained by the Contractor and certified competent by the Project Manager/Engineer. 6. Staff must be educated as to the need to refrain from indiscriminate waste disposal and/or pollution of local soil and water resources and receive the necessary safety training. 7. Staff must be trained in the hazards and required precautionary measures for dealing with these substances 8. Spillage packs must be available at construction areas.	Project Manager/Engineer	All waste managed according to approved Method Statement
Site preparation: General	1. Ensure that lay-down and other temporary infrastructure is within low- sensitivity areas, preferably previously transformed areas, if possible. 2. Wherever possible, locate infrastructure within areas that have been previously disturbed or in areas with lower sensitivity scores. 3. Access and service roads must be kept to a minimum and routes must also be adjusted to avoid areas of high sensitivity	Holder of the EA	PV placement takes into account identified sensitive areas Impacts to surface water features minimised. Appropriate stormwater structures incorporated in design

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
	as far as possible, as informed by a pre-construction walk-though surveys (if required). 4. Ensure that the design of the PV plant takes the sensitivity mapping of the specialists into account to avoid and/or reduce the impacts on Species and habitats of Conservation Concern. 5. Where possible, buildings must be consolidated to reduce visual clutter. 6. Where possible, buildings must be painted with natural tones that fit with the surrounding environment. Non-reflective surfaces should be utilised where possible. 7. Personnel must be educated about protection status of terrestrial species, including distinguishing features to be able to identify protected species.		
SPECIFIC MITIGATION MEASURES			
Site preparation: Specialist Assessments	1. Identify protected areas prior to construction. 2. It is recommended that Heritage site LD02 be preserved and a buffer fence of 20 meters constructed around the site. 3. Heritage site LD13 is older than 60 years and protected under section 34 of the NHRA. It is recommended that the site be documented by means of a layout drawing and photographic documentation after which a destruction permit must be applied for from the North West Provincial Heritage Authority, prior to destruction (if required). 4. All the identified triggered activities and water uses identified as part of the Surface Water Assessment should be confirmed with the relevant government authoritative departments. 5. Where one (1) infrastructure option is preferable over another, but there are still sensitive habitats affected, the infrastructure should be moved to avoid the sensitivity, wherever possible. 6. Areas outside the direct construction camp footprint must be fenced-off or marked in some other appropriate manner and no activities must be permitted there.	Holder of the EA	The design fully responds to the recommendations of the specialists. Pre-construction walk-through conducted, sensitive areas demarcated Erosion plan implemented and hydrological measures in place PV placement takes into account the bat and avifaunal sensitivities. The final layout avoids protected plant species as far as possible. Impacts to heritage features avoided or managed as per specialist

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
	7. Vehicles and personnel must be prohibited from being in natural areas outside the footprint of the proposed construction. Access for unauthorised personnel must also be limited. 8. A Biodiversity Rehabilitation Programme should be established before operation. The programme must address the rehabilitation of the existing habitats as well as rehabilitation after closure. This Rehabilitation Programme must be approved by the relevant government departments. 9. A botanical walk-through survey is a requirement only to ensure legal compliance and should take place once the final layout has been determined. 10. It is recommended that a monitoring programme be implemented to enforce continual eradication of alien and invasive species. An Alien Invasive Programme is an essential component to the successful conservation of habitats and species. This programme should include monitoring procedures. 11. Source unavailable materials from abroad (import). 12. **Preventing Indirect Erosion, Sedimentation and Run-off Impacts** – In general, adequate structures must be put into place (temporary or permanent where necessary in extreme cases) to deal with increased/accelerated run-off and sediment volumes. The use of silt fencing and potentially sandbags or hessian "sausage" nets can be used to around the lay-down area to prevent run-off flowing into the surrounding area and possibly, any nearby surface water resources. This will additionally assist with preventing consequent erosion and sedimentation in susceptible surrounding areas. 13. **Preventing Water Quality and Soil Contamination Impacts** – All fuels, oils and any other hazardous substances or liquids must be contained in bunded areas of 110% capacity to		recommendations. Input obtained from heritage authorities Grave relocation process compiled and approved by experienced consultant Layout drawing and photographic documentation of Heritage site LD13 Destruction permit applied for from the North West Provincial Heritage Authority for Heritage site LD13 (if required) and proof of this kept on record

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
	prevent fuels, oils and any other hazardous substances or liquids contamination in run-off affecting any surface water resources on the study site. Additionally, any fueling and re-fueling activities must also take place over a bunded area of 110% capacity to prevent contamination in run-off entering surface water resources on the study site. Drainage in bunded areas must be removed or drained to capture sumps, grit / oil separators and/or sand filter traps. 14. All vehicles and equipment must be regularly maintained to avoid any oil, fuel or hazardous leaks or spills. Spillage clean up kits must be readily available on site should an incident occur. All leaks and spillages must be cleared as soon as practically possible. 15. A spill contingency plan must be compiled and implemented. All staff must be made aware of this protocol. In addition, soil contingency measures must be provided e.g. oil spill kits and fire extinguishers. 16. Temporary chemical toilets must be provided and must be serviced on a regular basis. 17. Solid waste must be removed on a regular basis as soon as practically possible. 18. **Preventing Fire Risks** – Operational fire extinguishers are to be available in the case of a fire emergency. Given the dry seasons and strong winds that the region experiences, it is recommended that a fire management and emergency plan is compiled. A suitably qualified health and safety officer must compile the fire management and emergency plan for proposed development.		

8.1.2 Documentation

This section deals with the preparation and storage of documents essential for the duration of the project.

Table 8: Site documentation

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
Site documentation: Documents to be kept and updated on site for the duration of the contract	The following documents are to be kept in an Environmental File in the site camp: 1. Final EMPr, once approved by the NW DEDECT; 2. EA issued by the NW DEDECT; 3. Relevant permits; 4. Environmental Policy of the Contractor; 5. Environmental method statements compiled by the Contractor; 6. Minutes and record of attendance of all environmental meetings; 7. Environmental incident book; 8. Communications register; 9. Register of audits; 10. Non-conformance reports; and 11. Waste manifests.	Holder of the EA	All relevant documentation will be up to date and available for inspection by Key Stakeholders and the Public. Ensure the EA and EMPr is adhered to.
Site documentation: Method Statements for approval prior to commencement of construction	1. A method statement including the following information where applicable: • The type of construction activity; • Timing and location of the activity; • Construction procedures; • Materials and equipment to be used; • Transportation of the equipment to and from site; • How the equipment / material will be moved while on site; • Location and extent of construction site office and storage areas; • Identification of impacts that might result from the construction activity; • Population impacts; • Community / institutional arrangements; • Conflicts between local residents and newcomers; • Individual and family level impacts;	Holder of the EA	Detailing the process of how particular activities will be carried out. Dangers and risks associated with certain activities are highlighted by the Contractor Ensure the EMPr is adhered to.

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
	• Community infrastructure needs; • Intrusion impacts; • Methodology and/or specifications for impact prevention or containment and for environmental monitoring; • Emergency / disaster incident and reaction procedures (required to be demonstrated); and • Rehabilitation procedures and continued maintenance of the impacted environment. 2. A Method Statement is a document detailing how a particular process will be carried out. It must detail the possible dangers / risks associated with the particular part of the project and the methods of control to be established and to show how the work will be managed in a safe and environmentally responsible manner		
Site documentation: Communications register / environmental complaints register	3. All complaints or communications that are received from I&APs or any other stakeholder must be recorded in a communications register, which must include the following information: • Record the time and date of the complaint/communication; • A detailed description of the complaint/communication; • Action and resources used to correct the complaint; • Photographic evidence of the complaint (where possible); • A written response to the complainant indicating rectification of the complaint; and • Information regarding the relevant authority that was contacted or notified in writing where applicable (person, time and date). 4. Complaints and communications must be brought to attention of the Holder of the EA, whereupon it must be investigated and a response to the Complainant, I&APs or stakeholder must be given within ten (10) days.	Holder of the EA	All environmental incidents and community complaints are adequately dealt with. Ensure effective communication with the community and Key Stakeholders

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
	5. Relevant authorities include but not limited to: • Department of Human Settlements Water and Sanitation (DHSWS) (e.g. for any incidents involving the contamination of water resources). • NW DEDECT (e.g. for any significant incident of pollution of the soil and air). • Department of Agriculture (e.g. uses of appropriate herbicides for eradication of alien invasive species, and permits for trees of special concern). • Department of Health (e.g. for incidents such as contamination of water resources, accidental spill of hazardous substances). • Department of Transport (e.g. for the diversion of traffic due to construction activities). • North West Provincial Heritage Resources Authority (NW PHRA); and • South African Heritage Resources Agency (SAHRA).		
Site documentation: Photographic record for all phases of the project	1. Compile photographic record (dated) of all activities on site prior to start of construction related activities, during construction process and on completion of construction related works. This photographic record must include • A pre-construction site record; • Monthly environmental audit reports; • Corrective action; • Progress of environmental works; and • Incidences of non-conformance.	Holder of the EA	The state of the environment in pre-construction, construction, rehabilitation and operation phases are captured for effective documentation of the environment. To ensure EMPr is adhered to. All waste managed according to approved Method Statement
Site documentation: Waste manifests	1. The Contractor must ensure that all solid (including any hazardous) waste removed from site is disposed of at a registered landfill site or nearby waste transfer station with capacity to accept the project generated waste. 2. The waste manifest must be kept on record for auditing purposes. All waybills and disposal slips (e.g. safe disposal certificates, waste manifests) be retained for a minimum	Holder of the EA	All waste is disposed of in the correct manner and accounted for. To ensure EMPr is adhered to.

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
	period of five (5) years for the disposal activities associated with the construction and decommissioning of the proposed solar PV plant.		
Site documentation: Good housekeeping	1. The Contractor is to practice good housekeeping throughout the construction phase. This should eliminate disputes about responsibility, facilitate efficient and timeous running of the project. Over and above practicing accepted construction methods in accordance with SANS 10120, this should include measures to preserve the environment inside the work area. 2. Records of such actions taken to ensure the maintenance and management of housekeeping must be recorded. 3. The Contractor must record and report upon environmental management measures undertaken to mitigate assessed impacts upon the environment.	Holder of the EA	All waste is disposed of in the correct manner and accounted for. Housekeeping is attended to timeously. To ensure EMPr is adhered to.
Site documentation: Management and control	1. The Contractor is to implement environmental management in a reasonable manner and should such management not prove effective, must implement measures to the satisfaction of the Holder of the EA. Appropriate measures must include: • Appointment of necessary resources to monitor and manage environmental requirements; • Implement aspect-specific method statements to deal with emergency situations; • Provision of adequate emergency response equipment to mitigate and manage an incident or emergency; and • Provision of specific training related to implementation of environmental management requirements. 2. The Contractor must maintain detailed records of parameters monitored. These detailed records must demonstrate the effectiveness of the management actions implemented to mitigate potential impacts. The Contractor must submit a monthly database / report of management works implemented to the Holder of the EA, as part of the Contractors monthly report.	Holder of the EA	Appointment of a responsible EO to implement the EMPr, EA and Method Statements on behalf of the Contractor.

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
Site documentation: Monitoring	1. Contractor must submit Environmental Monitoring Method Statement which details scope, nature, process, schedule, and templates for environmental monitoring 2. Monitoring results and the associated required management and mitigation actions for the coming monitoring period are to be presented in the monitoring section of the Contractors monthly report. 3. The daily and weekly reports are to detail observations and information relating to requested management actions and their effectiveness. 4. Monitoring results must be used to determine effectiveness of management programme. 5. All complaints, compliments or other comments relating to environmental management parameters must be recorded in site issues register of Contractor for inclusion in project issues register held by Holder of EA. 6. The Contractor must monitor and maintain the following on an on-going basis as a minimum: • Re-growth of alien invasive vegetation; • Validity of the pest control officer certificate; • Fire break requirements associated to construction related activities; • Stormwater systems; • Topsoil and backfill volumes; • Access road condition; • Dust generated from stockpiles; • Noise; • Water quality; • Erosion prevention; • Landscaping requirements for rehabilitation; and • Any other items specified in the EA.	Holder of the EA	Effective implementation of the EMPr and monitoring of the environment by the Contractor.

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
	7. The Contractor must maintain detailed records of parameters monitored. These detailed records must demonstrate the effectiveness of the management actions implemented to mitigate potential impacts. 8. Contractor must submit monthly database / report of management works implemented to Holder of the EA, as part of Contractors monthly report. 9. All complaints, compliments or other comments relating to construction related works are to be recorded by the Contractor in the communications register of the receiving party for inclusion in the project issues register. 10. Site clearance monitoring results and the associated required management and mitigation actions for the coming monitoring period are to be presented in the monitoring section of the Contractors monthly report. 11. The weekly reports are to detail observations and information relating to requested management actions and their effectiveness.		

8.1.3 Consultation

This section deals with the public consultation of the site and actions that need to be implemented before construction commences

Table 9: Consultation

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
Consultation	1. Provide a mechanism through which information could be exchanged between the Holder of the EA and stakeholders. 2. Identify relevant stakeholders and engage them at applicable stages of the construction process. 3. Inform the public about the proposed construction process. 4. Surrounding communities must be kept informed, through the identified and agreed consultation channels, of the commencement of construction.	Holder of the EA	Clear communication channels established

	5. Solicit views and concerns from the public and allow them to suggest mitigations and enhancement measures.		
SPECIFIC MITIGATION MEASURES			
Heritage	6. It is recommended that consultation with local communities on the previous inhabitants of these areas be initiated to determine the possibility of infant burials. If such burial is confirmed a grave relocation process must be initiated.	Holder of the EA	Clear communication channels established

8.1.4 Site Clearing

This section deals with site clearing and actions that need to be implemented before construction commences

Table 10: Site Clearing

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
Site Clearing	1. The area cleared must be as small as feasibly possible. 2. Site clearing must take place in a phased manner, as and when required. 3. Areas which are not to be constructed on within two (2) months must not be cleared to reduce erosion risks. 4. The area to be cleared must be clearly demarcated and this footprint strictly maintained. 5. Spoil that is removed from the site must be removed to an approved spoil site or a licensed landfill site. 6. The necessary silt fences and erosion control measures must be implemented in areas where these risks are more prevalent.	Holder of the EA	Site establishment undertaken in line with the requirement of the EMPr Pre-construction walk-through conducted, sensitive areas identified. Erosion plan implemented and hydrological measures in place. Appropriate stormwater structures incorporated in final design. Key sensitive areas avoided

8.2 Construction Phase

- Makes sure that construction activities are properly managed in respect of environmental aspects and impacts.
- Makes sure construction activities to be undertaken without significant disruption to other land uses and activities in the area, in particular concerning noise impacts, farming practices, traffic and road use, and effects on local residents.
- Minimises the impact on the indigenous natural vegetation, protected tree species, and habitats of ecological value.
- Minimises impacts on fauna using the site.
- Minimises the impact on heritage sites should they be uncovered.

8.2.1 Construction Camp

This section deals with construction camp and actions that need to be implemented during construction

Table 11: Construction Camp

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
Construction Camp: Site of construction camp	1. The Contractor's camp must take into account location of local residents and / or ecologically sensitive areas (such a wetlands and drainage lines), including flood zones. The Construction camp position will be determined by the EA. 2. The size of the construction camp must be kept to a minimum. 3. Adequate parking must be provided for site staff and visitors. The Contractor must attend to drainage of the camp site to avoid standing water and / or sheet erosion. 4. Suitable control measures over the Contractor's yard (Clean and tidy yard area) plant (not causing smoke, and or, noise pollution unnecessarily) and material storage (organised, and neat) to mitigate any visual impact of the construction activity must be implemented. 5. Increase permeability of the fences to medium-to-small wildlife and wildlife-friendly designs.	Holder of the EA	Ensure the conditions of the EA are adhered to. Compliance to all legislative requirements. Impacts avoided or managed as per specialist recommendations.

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
Construction Camp: Construction camp	6. The ECO and Contractor must inspect the Construction Camp site to confirm and note any environmental sensitivity. 7. The construction camp layout plan must be provided to the ECO for approval prior to the construction of the camp. 8. The construction camp must be fenced off and on-site security must be put in place prior to commencing with the construction activities. 9. The Contractor must supply a wastewater management system that will comply with legal requirements and be acceptable to the Holder of the EA if this does not already exist on the site. 10. Site establishment must take place in an orderly manner and all required amenities must be installed at camp sites before the main workforce move onto site. 11. All construction equipment must be stored within the construction camp unless temporarily stored at immediate area where work is undertaken. 12. All oil changes must take place on a sealed surface such as a concrete slab that is bunded, or a similar appropriate surface. 13. The Construction Camp must be provided with portable fire extinguishing equipment, in accordance with all relevant legislation and must be readily accessible. 14. The Contractor must provide sufficient ablution facilities (1 toilet per every 12 workers), in the form of portable / VIP toilets, at the Construction Camps, and must conform to all relevant health and safety standards and codes. No pit latrines, French drain systems or soak away systems must be allowed and toilets must not be situated within 50 meters of any surface water body or 1:100-year flood line. 15. The portable chemical toilet/s (ablution facilities) at the construction camp must be serviced on a weekly basis (as well as when required) for the duration of the construction phase, to ensure that no spillages occur, and to provide safe working conditions for workers.	Holder of the EA	Ensure the conditions of the EA are adhered to. Compliance to all legislative requirements. Impacts avoided or managed as per specialist recommendations. Ensure safety of the public and prevent loss/ damage equipment. All hazardous substances managed according to approved Method Statement. No unauthorised open fires on site.

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
	16. The Contractor must inform all site staff to make use of supplied ablution facilities and under no circumstances must indiscriminate sanitary activities be allowed. 17. No fires will be allowed and the Contractor must make alternative arrangements for heating. LP Gas must be used, provided that all required safety measures are in place. The Contractor must take specific measures to prevent the spread of veld fires, caused by activities at the campsites. These measures must include appropriate instruction of employees about fire risks and the construction of firebreaks around the site perimeter. 18. Should an area for cooking be required, it must be inspected and approved by the ECO prior to use.		
Construction Camp: Storage of materials (including hazardous materials)	1. An area for the storage of hazardous materials must be established that conforms to the relevant safety requirements and that provides for spillage prevention and containment. 2. Choice of location for storage areas must take into account prevailing winds, distances to water bodies, general onsite topography and water erosion potential of the soil. Impervious surfaces must be provided where necessary. 3. Storage areas must be designated, demarcated and fenced if necessary. 4. Storage areas must be secure so as to minimize the risk of crime. They must also be safe from access by unauthorised persons i.e. children / animals etc. 5. Fire prevention facilities must be present at all storage facilities. 6. Proper storage facilities for the storage of oils, grease, fuels, chemicals and any hazardous materials to be used must be provided to prevent the migration of spillage into the ground and groundwater regime around the temporary storage area(s). These pollution prevention measures for storage must include a bund wall high enough to contain at least 110% of any stored	Holder of the EA	All hazardous substances managed according to approved Method Statement.

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
	volume, and this must be sited away from drainage lines on a site with the approval of the ECO. 7. Above-ground fuel storage tanks must be housed in an adequate bund capable of holding 110% of the total volume of the tanks combined (i.e. 1000m^3). 8. All fuel storage areas must be roofed to avoid creation of dirty storm water 9. Material Safety Data Sheets (MSDSs) must be readily available on site for all chemicals and hazardous substances to be used on site. Where possible the available, MSDSs must additionally include information on ecological impacts and measures to minimise negative environmental impacts during accidental releases or escapes. 10. Storage areas containing hazardous substances / materials must be clearly signposted. 11. Staff dealing with these materials / substances must be aware of their potential impacts and follow the appropriate safety measures. 12. All excess cement and concrete mixes are to be contained within a bunded area on the construction site prior to disposal off site. 13. All major spills as specified in the contractor emergency response procedure of any materials, chemicals, fuels or other potentially hazardous or pollutant substances must be cleaned immediately, and the cause of the spill investigated. Preventative measures must be identified and submitted to the Main Contractor and ECO for information. Emergency response procedures to be followed and implemented. 14. In the event of a significant spill or leak of hazardous substances (e.g. petrol and diesel), such incident(s) must be reported to all relevant authorities, including the NW DEDECT, in accordance with section 30(1)(c) of the NEMA, 1998 pertaining to the control of incidents.		

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
Construction Camp: Drainage of construction camp	1. Surface drainage measures must be established in the Construction Camps so as to prevent • Ponding of water; • Erosion as a result of accelerated runoff; and • Uncontrolled discharge of polluted runoff.	Holder of the EA	Storm Water Management Plan provided and accepted prior to construction commencing Storm Water Management Plan implemented Appropriate storm water structures incorporated in final design. Erosion plan implemented and hydrological measures in place.
Construction Camp: Reporting on suspicious activities	1. Encourage local people to report any suspicious activity associated with the construction sites through the establishment of a community liaison forum; 2. Prevent loitering within the vicinity of the construction camp as well as construction sites.	Holder of the EA	Clear communication channels established

8.2.2 Environmental Education and Training

This section deals with the environmental training of construction employees.

Table 12: Environmental Education and Training

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
Environmental education and training: Environmental training	1. The Holder of the EA must appoint an ECO prior to construction 2. Ensure that all site personnel have a basic level of environmental awareness training. The ECO will be responsible for the induction of core project team and topics covered must include: • What is meant by "Environment"; • Why the environment needs to be protected and conserved; • How construction activities can impact on the environment; • What can be done to mitigate against such impacts;	Holder of the EA/ Contractor	All staff members are aware of the EMPr requirements relevant to them.

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
	• Awareness of emergency and spills response provisions; • Social responsibility during construction e.g. being considerate to local residents; and • Specific mitigation measures stipulated in the EMPr and EA. 3. Environmental awareness training for all construction staff must be undertaken by the Contractor prior to construction starting. Translators are to be used where necessary. The topics covered must include, but not be limited to the following: • Use of the appropriate fire-fighting equipment; • The need for a "clean site" policy; • The prevention of accidental spillage of hazardous chemicals and oil; • Pollution of water resources (both surface and groundwater); • Air pollution and litter control; • The need to refrain from indiscriminate waste disposal and/or pollution of local soil and water resources; and • General safety. 4. Training of new staff that did not receive the initial training is the responsibility of the Contractor. 5. Staff operating equipment (such as cranes, etc.) must be adequately trained and sensitized to any potential hazards associated with their tasks. 6. No operator must be permitted to operate critical mechanical equipment without having been trained by the Contractor and certified competent by the Project Manager.		
Environmental education and training: Monitoring of environmental training	• The Contractor must monitor the performance of construction workers to ensure that the points relayed during their introduction have been properly understood and are being followed. Toolbox talks are required	Holder of the EA	Thorough induction to site.

8.2.3 Erosion Control

This section deals with erosion issues and actions that need to be implemented during construction.

Table 13: Erosion Control

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
Erosion Control	1. Wind screening and storm water control should be undertaken to prevent soil loss from the site. 2. The use of silt fences and sand bags must be implemented in areas that are susceptible to erosion. 3. Other erosion control measures that can be implemented are as follows: • Brush packing with cleared vegetation • Mulch or chip packing • Planting of vegetation • Hydroseeding / hand sowing 4. Sensitive areas need to be identified prior to construction so that the necessary precautions can be implemented. 5. All erosion control mechanisms need to be regularly maintained. 6. Seeding of topsoil and subsoil stockpiles to prevent wind and water erosion of soil surfaces. 7. Retention of vegetation where possible to avoid soil erosion 8. Vegetation clearance should be phased to ensure that the minimum area of soil is exposed to potential erosion at any one time. 9. Re-vegetation of disturbed surfaces should occur immediately after construction activities are completed. This should be done through seeding with indigenous grasses that were present on the site prior to construction. 10. No impediment to the natural water flow other than approved erosion control works is permitted. 11. To prevent stormwater damage, the increase in stormwater run-off resulting from construction activities must be estimated and the drainage system assessed accordingly.	Holder of the EA	Erosion plan implemented and hydrological measures in place. Erosion minimised and due care illustrated throughout project life cycle Appropriate storm water structures incorporated in final design.

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
	12. Stockpiles not used in three (3) months after stripping must be seeded to prevent dust and erosion.		
SPECIFIC MITIGATION MEASURES			
Erosion control	1. **<u>Preventing Increased Run-off and Sedimentation Impacts</u>** • An appropriate storm water management plan formulated by a suitably qualified professional must accompany the proposed development to deal with increased run-off in the designated construction areas. • In general, adequate structures must be put into place (temporary or permanent where necessary in extreme cases) to deal with increased/accelerated run-off and sediment volumes. • The use of silt fencing and potentially sandbags or hessian "sausage" nets can be used to prevent erosion in susceptible construction areas. • All impacted areas are to be adequately sloped to prevent the onset of erosion. • Importantly, special attention must be given and implemented at the recommendation of the ECO for site specific erosion, sedimentation and run-off mitigation measures at the edge of the buffer zones of the surface water resources if and where required. 2. Avoid extensive vegetation removal; re-vegetate as soon as possible and maintain cover (irrigate if necessary).	Holder of the EA	Storm Water Management Plan provided and accepted prior to construction commencing Storm Water Management Plan implemented Appropriate storm water structures incorporated in final design Erosion plan implemented and hydrological measures in place.

8.2.4 Storm Water Management

This section deals with specific storm water management issues and actions that need to be implemented during construction. Please be advised a Storm Water Management Plan has been compiled by a suitably qualified specialist and has been included as Annexure F.

Table 14: Storm Water Management

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
SPECIFIC MITIGATION MEASURES			
Storm Water Management	1. Maintain adequate ground cover in all areas at all times to reduce the risk or erosion by wind, water and all forms of traffic; 2. Prevent concentration of storm water flow at any point where the ground is susceptible to erosion. Where unavoidable, adequate protection of the ground must be provided; 3. Reduce storm water flows as much as possible by providing effective attenuation measures; 4. Ensure that development does not increase the rate of storm water flow above that which the natural ground can safely accommodate at any point; 5. Ensure that all storm water control works are constructed in a safe and aesthetic manner in keeping with the overall development; 6. Prevent pollution of waterways and water features; 7. Contain soil erosion by constructing protective works to trap sediment at appropriate locations. This applies particularly during construction; and 8. Avoid situations where natural or artificial slopes may become saturated and unstable, both during and after the construction process. 9. Development designs must include measures for attenuating the concentration of and, increase in storm water runoff. The post-development peak flows are to be attenuated back to pre-development conditions; 10. Before the commencement of any construction activities, a plan must be agreed upon which details the measures to be	Holder of the EA	Storm Water Management Plan provided and accepted prior to construction commencing Storm Water Management Plan implemented Appropriate storm water structures incorporated in final design Erosion plan implemented and hydrological measures in place.

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
	implemented to control and prevent erosion during and after construction; 11. On-site storm water control systems, such as swales, berms and attenuation ponds are to be constructed before any other construction commences. These systems are to be monitored and appropriately adjusted as construction progresses to ensure complete storm water, erosion and pollution control at all times; 12. All embankments to be formed must be adequately stabilized; 13. Storm water must not be allowed to pond in close proximity to building foundations; 14. An approved landscaping and re-vegetation plan must be implemented immediately after building works have reached a stage where newly established ground cover is not at risk from the construction works; 15. No work is to commence without an approved Storm Water Control Plan (SCP). The SCP must describe what storm water control measures are to be implemented before, during and after construction. Plans must indicate all persons responsible for the design and on-site monitoring during each stage of the implementation of the control measures; 16. The SCP must show that all the provisions, regulations and guidelines contained in this document have been considered; 17. In the event of a failure to adequately implement the approved SCP, the contractor shall be responsible for making good all consequential damage at his own cost. The developer is therefore advised to ensure that all members of the professional team and contractors are competent to undertake the development work and are adequately insured; 18. The management of storm water run-off during construction will be controlled by the Environmental Management Plan (EMP) as produced by the Environmental Control Officer (ECO). All construction activities within the development must comply with		

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
	the EMP. This document is supplementary to the EMP and the control measures set out herein are not to be considered all-encompassing as the contractor will also have to adapt his control measures to the varying onsite conditions; 19. All elements of the minor storm water system shall be designed to safely accommodate and convey the 1:10 year storm event to the major storm water system elements, which will be designed to accommodate the 1:50 year storm event. Exceptions to these capacities are to be made by the design engineer after assessing the risks; 20. Attenuation/Detention facilities will be located at appropriately selected sites based on geotechnical, environmental and topographical conditions, including wetland conservation; 21. Where conditions permit, open ditches, drains and channels will be used instead of pipes. On steeper slopes, where high flow velocities are anticipated, appropriate linings for all channels must be provided to withstand erosion. Such linings will vary from vegetated earthen to stone pitching and reinforced concrete; 22. Flow velocities must be reduced wherever possible to reduce the erosion potential in channels, natural ground and points of flow concentration (typically at outlets); 23. Silt, trash and oil traps must be strategically provided to ensure water quality is not compromised and to prevent blockages in the drainage systems; 24. Areas within the proposed development that bound on storm water attenuation areas, near road crossings, watercourse confluences and water features might be subject to flooding. In these situations, all development should take place above the outfall levels with an appropriate freeboard allowance; 25. For areas flowing into the development area, potential future development in these sub-catchments should be considered and any storm water attenuation requirements should be		

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
	identified. Likewise, consideration must be given to the storm water flowing out of the development which may impact on the downstream areas and watercourses. Appropriate measures must be taken to ensure any upstream development does not result in an increased flood damage risk downstream; and 26. All natural and unlined channels should be inspected for adequate binding of soil by sustainable ground cover. Stone pitching should be used to reinforce channel inverts on steep slopes. Existing wetlands and storm water attenuation areas should be protected from encroachment by the development.		

8.2.5 Water Use and Quality and Aquatic Ecology / Surface Water

This section deals with water use and quality issues and actions that need to be implemented during construction.

Table 15: Water Use and Quality and Aquatic Ecology

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
Water Use and Quality: Water Use	1. Develop a sustainable water supply management plan to minimize the impact to natural systems by managing water use, avoiding depletion of aquifers and minimizing impacts to water users. 2. Water must be reused, recycled or treated where possible. 3. Consultation with key stakeholders to understand any conflicting water use demands and the community's dependency on water resources and conservation requirements within the area.	Holder of the EA	Compliance to all legislative requirements. Water Management Plan
Water Use and Quality: Water Quality	1. The quality and quantity of effluent streams discharged into the environment including storm water must be managed and treated to meet applicable effluent discharge guidelines. 2. Efficient oil and grease traps or sumps must be installed and maintained at refuelling facilities, workshops, fuel storage depots, and containment areas and spill kits must be available with emergency response plans.	Holder of the EA	Storm Water Management Plan implemented. Waste Management Plan Implemented

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
	3. Refuelling, handling of hydrocarbon products or maintenance and servicing of heavy earthmoving vehicles must not take place over within 32m of any on-site watercourses. All vehicle maintenance or refuelling must be done off-site, or alternatively, in a designated (hard or impermeable surface) area on-site.		
Water Use and Quality: Storm Water	4. The site must be managed in order to prevent pollution of drains, downstream watercourses or groundwater, due to suspended solids and silt or chemical pollutants. 5. Temporary cut off drains and berms must be required to capture storm water and promote infiltration. 6. Promote a water saving mind set with construction workers in order to reduce water wastage. 7. New storm water systems must be developed strictly in accordance with engineers' specifications in order to ensure efficiency. 8. Hazardous substances (fuel) must be stored at least 50m from any water bodies on site to avoid pollution. 9. The installation of the storm water system must take place as soon as possible to attenuate storm water from the construction phase as well as the operation phase. 10. Earth, stone and rubble is to be properly disposed of, or utilized on site so as not to obstruct natural water pathways over the site. i.e. these materials must not be placed in storm water channels, drainage lines or rivers. 11. There must be periodic checking of the site's drainage system to ensure that the water flow is unobstructed. 12. If a batching plant is necessary, run-off must be managed effectively to avoid contamination of other areas of the site. Untreated runoff from the batch plant must not be allowed to get into the storm water system or nearby streams, rivers or erosion channels or dongas.	Holder of the EA	Storm Water Management Plan implemented.

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
Water Use and Quality: Sanitation	1. Adequate sanitary facilities and ablutions must be provided for construction workers (1 toilet per every 20 workers). 2. The facilities must be regularly serviced to reduce the risk of surface or groundwater pollution	Holder of the EA	No sewage spillages and tidy ablution facilities.
Water Use and Quality: Concrete Mixing	1. Concrete contaminated water must not enter soil or any natural drainage system as this disturbs the natural acidity of the soil and affects plant growth.	Holder of the EA	Batching plant managed according to approved Method Statement
Water Use and Quality: Public areas	1. Food preparation areas must be provided with adequate washing facilities and food refuse must be stored in sealed refuse bins which must be removed from site on a regular basis. 2. The contractor must take steps to ensure that littering by construction workers does not occur and persons must be employed on site to collect litter from the site and immediate surroundings, including litter accumulating at fence lines. 3. No washing or servicing of vehicles on site unless in abounded area and agreed to by the ECO.	Holder of the EA	All staff members are aware of the EMPr requirements relevant to them. Storm Water Management Plan implemented. Compliance to all legislative requirements. All waste managed according to approved Method Statement Vehicles repaired as per the approved Method Statement for vehicles management

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
SPECIFIC MITIGATION MEASURES			
Aquatic Ecology / Surface Water: Vehicle and Machinery Degradation Impacts to Wetlands	1. **<u>Preventing Physical Degradation of the Wetlands</u>** • Ideally, the existing road to be upgraded should be re-aligned outside of Depression Wetland 2. This is the most important mitigation measure in order to avoid direct impact to this wetland. ***Should this not be possible, the necessary environmental authorization and water use license will be required before construction can commence.*** • In general, no construction is to take place within 50m nor directly within any of the identified and delineated wetlands unless absolutely necessary. • The delineated wetlands and associated buffer zones are to be clearly demarcated as highly sensitive. Demarcations are to be made visible and no access into these areas is to be allowed unless being authorized / licensed to do so. 2. **<u>Limiting Physical Degradation to Wetlands</u>** • Should an Environmental Authorization and / or WUL permit be issued for construction in and near wetlands, a single access route or "Right of Way" (RoW) is to be established through or in the desired construction area in the wetland. • The environmentally authorized and water use license permitted construction area is to be demarcated and made clearly visible in conjunction to the RoW. • The width of the RoW must be limited to the width of the vehicles required to enter the wetland (no more than a 3m width). • Vegetation should not be cleared across the entire RoW. Rather, only the vehicle tracks should be cleared. Remaining vegetation can be kept trimmed to below 30cm but not lower than 5cm height. • As the wetlands soils have been identified to be temporarily saturated, gravel running tracks can be used for stability. The	Holder of the EA	Ensure the EMPr is adhered to Ensure the conditions of the EA are adhered to Compliance to all legislative requirements All staff members are aware of the EMPr requirements relevant to them Implementation of Alien Invasive Species Management Impacts avoided or managed as per specialist recommendations. Erosion plan implemented and hydrological measures in place Storm Water Management Plan implemented All waste managed according to approved the Method Statement compiled by the contractor and approved by the engineer and reviewed by ECO Watercourse Rehabilitation and Management Plan

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
	gravel tracks will however need to be removed as soon as construction is complete. • No tracks may be crossed in any surface water resource either during or directly after a rainfall event. The affected areas will need to be rehabilitated. • A wetland rehabilitation plan will be required. This must be compiled by a suitably qualified wetland specialist. The rehabilitation plan must also be approved by the relevant governmental environmental and water authorities. 3. **Preventing Soil Contamination** • No vehicles are to be allowed in the highly sensitive areas unless authorised. • Should vehicles be authorised in highly sensitive areas by the Project Manager / Engineer (provided the relevant approvals / permits have been obtained / are in place), all vehicles and machinery are to be checked for oil, fuel or any other fluid leaks before entering the required construction areas. • All vehicles and machinery must be regularly serviced and maintained before being allowed to enter the construction areas. • No fueling, re-fueling, vehicle and machinery servicing or maintenance is to take place in the highly sensitive areas. • The construction site is to contain sufficient spill contingency measures throughout the construction process. These include, but are not limited to, oil spill kits to be available, fire extinguishers, fuel, oil or hazardous substances storage areas must be bunded to prevent oil or fuel contamination of the ground and/or nearby wetland or the associated buffer zone.		Watercourse Maintenance and Management Plan (WMMP)
Aquatic Ecology / Surface Water: Human	1. **Minimising Human Physical Degradation of Sensitive Areas** • Construction workers are only allowed in the designated construction areas and not into the surrounding wetlands.		

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
Degradation of Flora and Fauna associated with Wetlands	• Highly sensitive areas are to be demarcated and made clearly visible prior to the commencement of construction and no access beyond these areas is to be allowed to construction workers unless in authorised RoW areas. • No animals on the construction site or surrounding areas are to be hunted, captured, trapped, removed, injured, killed or eaten. • Should any party be found guilty of such an offence, stringent penalties must be imposed. • However, where animals (including snakes and reptiles) pose a threat to the safety of workers, the appointed environmental control officer (ECO) is to be contacted for removal thereof. • No animals that are removed are allowed to be killed. • Removed animals must be relocated a safe distance from the RoW in close proximity to where they were found. • No “long drop” toilets are allowed on the study site. Suitable temporary chemical sanitation facilities are to be provided. • Temporary chemical sanitation facilities must not be placed within any surface water resource and / or the associated buffer zone. Temporary sanitation facilities must rather be placed at least 100m from the surface water resources where these are required. • Temporary chemical sanitation facilities must be regularly cleaned and adequately maintained (checked for leaks) to prevent pollution impacts. • No water is to be abstracted unless a water use license is granted for specific quantities for a specific water resource or abstraction is within Schedule 1 water uses in terms of the NWA. • No hazardous or building materials are to be stored or brought into the highly sensitive areas.		

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
	• Should a designated storage area be required, the storage area must be placed at the furthest location from the highly sensitive area. • Appropriate safety measures as stipulated above must be implemented. • No cement mixing is to take place in the surface water resources or the associated buffer zones. • In general, any cement mixing should take place over a bin lined (impermeable) surface or alternatively in the load bin of a vehicle to prevent the mixing of cement with the ground. • Importantly, no mixing of cement directly on the surface is allowed in the highly sensitive area.		
Aquatic Ecology / Surface Water: Degradation of Soils and Vegetation associated with the Wetlands	1. **Preventing Physical Degradation of the Wetlands** • The necessary Environmental Authorization and / or WUL permit must be obtained prior to construction. • Accordingly, the permitted construction area is to be established as a RoW area, as described in **Sections 8.2.1** and **8.2.2 of the DBAR**. 2. **Rehabilitation of RoW Areas** • The affected RoW zones in the sensitive areas must be re-instated with the soils removed (if any) from the wetlands, and the affected areas must be levelled, or appropriately sloped and scarified to loosen the soil and allow seeds contained in the natural seed bank to re-establish. • Rehabilitation areas will need to be monitored for erosion and invasion of alien vegetation species until re-growth can establish where prevalent.		
Aquatic Ecology / Surface Water: Increased Run-off, Erosion and	1. **Preventing Increased Run-off and Sedimentation Impacts** • Vegetation clearing should take place in a phased manner, only clearing areas that will be constructed on immediately. • Vegetation clearing must not take place in areas where construction will only take place in the distant future.		

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
Sedimentation Impacts	• An appropriate storm water management plan formulated by a suitably qualified professional must accompany the proposed development to deal with increased run-off in the designated construction areas. • Adequate structures must be put into place (temporary or permanent where necessary in extreme cases) to deal with increased/accelerated run-off and sediment volumes. • The use of silt fencing and potentially sandbags or hessian "sausage" nets can be used to prevent erosion in susceptible construction areas. • All impacted areas are to be adequately sloped to prevent the onset of erosion. • Importantly, special attention must be given and implemented at the recommendation of the ECO for site specific erosion, sedimentation and run-off mitigation measures at the edge of the buffer zones of the surface water resources if and where required.		

8.2.6 Waste Management

This section deals with waste management issues and actions that need to be implemented during construction.

Table 16: Waste Management

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
Waste Management: Litter Management	1. Refuse bins must be placed at strategic locations to ensure that litter does not accumulate within the construction site. 2. The Contractor must supply waste collection bins where such are not available and all solid waste collected must be disposed of at registered/licensed landfill. 3. A housekeeping team must be appointed to regularly maintain the litter and rubble situation on the construction site. 4. If possible and feasible, all waste generated on site must be separated into glass, plastic, paper, metal and wood and	Holder of the EA	All waste managed according to approved Method Statement

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
	recycled. An independent contractor can be appointed to conduct this recycling. 5. Littering by the employees of the Contractor must not be permitted under any circumstances. The ECO must monitor the neatness of the work sites as well as the Contractor campsite. 6. Skip waste containers must be maintained on site. These must be kept covered and arrangements made for them to be collected regularly. 7. All waste must be removed from the site and transported to a landfill site promptly to ensure that it does not attract vermin or produce odours. 8. Where a registered waste site is not available close to the construction site, the Contractor must suggest a suitable alternative. 9. Certificates of disposal must be obtained by the Contractor and kept on file, if relevant. 10. All waybills and disposal slips (e.g. safe disposal certificates, waste manifests) must be retained for a minimum period of five (5) years for the disposal activities associated with the construction and decommissioning of the proposed facility, per regulation 8(1) of the NEM:WA, 2008 Waste Classification and Management Regulations published in GN No. R. 634 of 23 August 2013. 11. Under no circumstances will solid waste be burnt on site. 12. All waste must be removed promptly to ensure that it does not attract vermin or produce odours. 13. An approved waste disposal contractor must be employed to remove and recycle waste oil, if practical. The contractor must ensure that its personnel are made aware of the health risks associated with any hazardous substances used, have been provided with the appropriate protective clothing/equipment in case of spillages or accidents and have received the necessary training.		

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
Waste Management: Hazardous Waste	1. All hazardous waste materials, if present, must be carefully stored as advised by the ECO, and then disposed of off-site at a licensed landfill site, where practical. 2. Contaminants to be stored safely to avoid spillage. 3. Machinery must be properly maintained to keep oil leaks in check 4. All necessary precaution measures must be taken to prevent soil or surface water pollution from hazardous materials used during construction and any spills must immediately be cleaned up and all affected areas rehabilitated		
Waste Management: Remedial Actions	1. Depending on the nature and extent of the spill, contaminated soil must be either excavated or treated on-site. 2. Excavation of contaminated soil must involve careful removal of soil using appropriate tools/machinery to storage containers until treated or disposed of at a licensed hazardous landfill site. 3. Polluted soil must be appropriately disposed of and/or treated. This could involve the application of soil absorbent materials as well as oil-digestive powders to the contaminated soil. 4. If a spill occurs on an impermeable surface such as cement or concrete, the surface spill must be contained using oil absorbent material. 5. If necessary, oil absorbent sheets or pads must be attached to leaky machinery or infrastructure. 6. Materials used for the remediation of petrochemical spills must be used according to product specifications and guidance for use. 7. Contaminated remediation materials must be carefully removed from the area of the spill so as to prevent further release of petrochemicals to the environment, and stored in adequate containers until appropriate disposal.		

8.2.7 Flora

This section deals with floral issues and actions that need to be implemented during construction.

Table 17: Flora

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
Flora: Existing Vegetation	1. Vegetation to be removed as it becomes necessary rather than removal of all vegetation throughout the site in one step. 2. Removal or disturbance of any TOPs, Red Data listed or Provincially protected species may only be done after obtaining permits from relevant authorities. 3. A permit is required for animal and plant search-and-rescue. 4. Materials must not be delivered to the site prematurely if possible, which could result in additional areas being cleared or affected.	Holder of the EA	Ensure the EMPr is adhered to. Ensure the conditions of the EA are adhered to. All staff members are aware of the EMPr requirements relevant to them
Flora: Rehabilitation	1. All natural areas outside of the project footprint impacted during construction must be rehabilitated with locally indigenous species typical of the representative botanical unit. Seeds from surrounding seed banks can be used for re-seeding. 2. Rehabilitation must take place in a phased approach as soon as possible. 3. Rehabilitation must be executed in such a manner that surface run-off will not cause erosion of disturbed areas.		Plant Rehabilitation Implemented Impacts avoided or managed as per specialist recommendations.
Flora: Demarcation of construction and laydown areas	1. All plants not interfering with the construction must be left undisturbed. Species of special concern must be clearly marked and recorded electronically. 2. The construction area must be well demarcated where this is viable and no construction activities must be allowed outside of this demarcated footprint 3. Vegetation removal must be phased in order to reduce impact of construction. 4. Strict and regular auditing of the construction process to ensure containment of the construction and laydown areas.		Plant Rescue Plan Implemented Ecological Management Plan Impacts avoided or managed as per specialist recommendations.

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
	5. Soils must be kept free of petrochemical solutions that must be kept on site during construction. Spillage can result in a loss of soil functionality thus limiting the re-establishment of flora.		
Flora: Utilisation of resources	6. Gathering of firewood, fruit, "muti" plants, or any other natural material onsite or in areas adjacent to the site is prohibited unless with prior approval of the ECO.		Impacts avoided or managed as per specialist recommendations.
Flora: Exotic Vegetation	1. Alien vegetation on the site will need to be controlled. 2. The contractor must be responsible for implementing a programme of weed and exotic species control (particularly in areas where soil has been disturbed); and grassing of any remaining stockpiles to prevent weed invasion.		Alien Plant Management Plan Implemented
SPECIFIC MITIGATION MEASURES			
Flora: Indigenous natural vegetation	1. Use existing road infrastructure for access roads. 2. Avoid construction of infrastructure within sensitive habitats. 3. Where one (1) infrastructure option is preferable over another, but there are still sensitive habitats affected, the infrastructure should be moved to avoid the sensitivity, wherever possible. 4. Minimise vegetation clearing and disturbance to footprint areas only. 5. Areas outside the direct construction camp footprint must be fenced-off or marked in some other appropriate manner and no activities must be permitted there. 6. Vehicles and personnel must be prohibited from being in natural areas outside the footprint of the proposed construction. 7. Access for unauthorised personnel must also be limited. 8. Compile a biodiversity rehabilitation programme and rehabilitate disturbed areas. The programme must address the rehabilitation of the existing habitats as well as rehabilitation after closure. This Rehabilitation Programme must be approved by the relevant government departments. 9. Compile an Alien Invasive Management Plan. This programme should include monitoring procedures.	Holder of the EA	Impacts avoided or managed as per specialist recommendations. Biodiversity rehabilitation programme compiled and implemented Biodiversity rehabilitation programme approved by relevant government department(s) and proof kept on record Alien Invasive Management Plan compiled and implemented Permits obtained and kept on record Monitoring being undertaken and results being kept on record Ensure the conditions of the EA are adhered to

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
	10. Monitoring should be undertaken to evaluate the success of mitigation measures.		Compliance to all legislative requirements.
Flora: Protected trees	1. Avoid damage or loss of trees in neighbouring areas (none were found within footprint areas during walk-through survey).		
Flora: Plant species of concern and protected plants and trees	1. It is a legal requirement to obtain permits for specimens that will be lost		
Flora: Ecosystems	1. Avoid or limit development within conservation zones, especially CBA1 areas		
Flora: Vegetation, ecosystems and habitats	1. Implement an alien management plan, which highlights control priorities and areas and provides a programme for long-term control. 2. Undertake regular monitoring to detect alien invasions early so that they can be controlled. 3. Do NOT use any alien plants during any rehabilitation that may be required.		

8.2.8 Fauna

This section deals with faunal issues and actions that need to be implemented during construction

Table 18: Fauna

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
Fauna	1. No trapping or snaring of fauna on the construction site. 2. No faunal species are to be harmed by maintenance staff during any routine maintenance at the development. 3. No animals are to be kept as pets except those owned by the landowners.	Holder of the EA	Impacts avoided or managed as per specialist recommendations. Ensure the conditions of the EA are adhered to.

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
	4. Any trenches that are required for cabling etc., must not be left open for extended periods as fauna such as tortoises will fall in and become trapped. Any open trenches must be checked regularly for trapped fauna.		Compliance to all legislative requirements
SPECIFIC MITIGATION MEASURES			
Fauna	1. Use existing road infrastructure for access roads. 2. Avoid construction of infrastructure within sensitive habitats. 3. Minimise vegetation clearing and disturbance to footprint areas only. 4. Compile a rehabilitation programme and rehabilitate disturbed areas. 5. Compile an Alien Invasive Management Plan. 6. Implement traffic control measures, including speed limits and no-go zones. 7. Monitoring should be undertaken to evaluate the success of mitigation measures.	Holder of the EA	Impacts avoided or managed as per specialist recommendations. Ensure the conditions of the EA are adhered to. Compliance to all legislative requirements Rehabilitation programme compiled and implemented Alien Invasive Management Plan compiled and implemented Compliance to Alien Invasive Management Plan Noise and lighting managed according to approved Method Statement Traffic control measures implemented All staff members are aware of the EMPr requirements relevant to them

8.2.9 Avifauna

This section deals with avifaunal issues and actions that need to be implemented during construction

Table 19: Avifauna

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
Avifauna	1. Ensure that key areas of conservation importance and sensitivity are avoided. 2. Implement appropriate working practices to protect sensitive habitats. 3. Provide adequate briefing for site personnel and, in particularly sensitive locations, employing an on-site ecologist during construction if necessary. 4. Implement an agreed post-development monitoring programme. 5. Where possible, install low voltage collector cables between the PVs underground (subject to habitat sensitivities and in accordance with existing best practice guidelines for underground cable installation). 6. Construction activity should be restricted to the immediate footprint of the infrastructure. 7. Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of priority species. 8. Measures to control noise and dust should be applied according to current best practice in the industry. 9. Maximum used should be made of existing access roads and the construction of new roads should be kept to a minimum.	Holder of the EA	Impacts avoided or managed as per specialist recommendations Ensure the conditions of the EA are adhered to Compliance to all legislative requirements Noise managed according to approved Method Statement
SPECIFIC MITIGATION MEASURES			
Avifauna	10. Construction activity should be restricted to the immediate footprint of the infrastructure. 11. Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of priority species. 12. Measures to control noise and dust should be applied according to current best practice in the industry. 13. Maximum used should be made of existing access roads and the construction of new roads should be kept to a minimum	Holder of the EA	Impacts avoided or managed as per specialist recommendations Dust suppression implemented and undertaken on a regular basis Noise managed according to approved Method Statement

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
			Ensure the conditions of the EA are adhered to Compliance to all legislative requirements

8.2.10 Air Quality

This table deals with mitigation measures to prevent air pollution

Table 20: Air Quality

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
Air Quality: Dust Control	1. Wheel washing and damping down of un-surfaced and un-vegetated areas must be undertaken if required. 2. Retention of vegetation where possible will reduce dust travel. 3. Excavations and other clearing activities must only be done during agreed working times and permitting weather conditions to avoid drifting of sand and dust into neighbouring areas. 4. Damping down of all exposed soil surfaces with a water bowser or sprinklers when necessary to reduce dust. 5. In cases where severe water restrictions are imposed, other measures like the use of wetting agents such as chemical stabilisation or "hydromulch", must be considered. In situations where the use of water is necessitated, non-potable water sources are to be utilised. 6. The Contractor must be responsible for dust control on site to ensure no nuisance is caused to the neighbouring communities. 7. A speed limit of 40km/h for cars and 30km/h for trucks must not be exceeded on site. 8. Any complaints or claims emanating from the lack of dust control must be attended to immediately by the Contractor. 9. Any dirt roads that are utilised by the workers must be regularly maintained to ensure that dust levels are controlled.	Holder of the EA	Impacts avoided or managed as per specialist recommendations Ensure the conditions of the EA are adhered to Compliance to all legislative requirements

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
Air Quality: Odour control	1. Regular servicing of vehicles in order to limit gaseous emissions. 2. Regular servicing of on-site toilets to avoid potential odours.		

8.2.11 Soils and Geology

This section deals with soils and geology issues and actions that need to be implemented during construction. General guidelines for management of soils are provided in **Annexure D**.

Table 21: Soils and Geology

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
Soils and Geology: Topsoil	1. The contractor must, prior to the commencement of earthworks determine the average depth of topsoil (if any), and agree on this with the Engineer. The full depth of topsoil must be stripped from areas affected by construction and related activities prior to the commencement of foundations. This must include the building footprints, working areas and storage areas. Topsoil must be reused where possible to rehabilitate disturbed surface areas. 2. Care must be taken not to mix topsoil and subsoil during stripping. 3. Should any topsoil become polluted the contractor must remove the polluted soil to the full depth of pollution and replace it at his own expense with clean topsoil. 4. Refuelling, handling of hydrocarbon products or maintenance and servicing of heavy earthmoving vehicles must not take place over bare soil. All vehicle maintenance or refuelling must be done off-site, or alternatively, in a designated (hard or impermeable surface) area on-site. 5. Removed polluted topsoil must be transported to a licensed landfill site. 6. The topsoil must be conserved on site in and around the pit area	Holder of the EA	Erosion plan implemented and hydrological measures in place All waste managed according to approved Method Statement Ensure the EMPr is adhered to

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
Soils and Geology: Soil Stripping	7. No soil stripping must take place on areas within the site that the contractor does not require for construction works or areas of retained vegetation. 8. Construction vehicles must only be allowed to utilize existing tracks or pre-planned access routes.		Ensure the EMPr is adhered to
Soils and Geology: Soil Stockpiles	1. Stockpiles must not be situated such that they obstruct natural water pathways. 2. Stockpiles must not exceed 2m in height unless otherwise permitted by the Engineer. 3. If stockpiles are exposed to windy conditions or heavy rain, they must be covered either by vegetation or geofabric, depending on the duration of the project. Stockpiles must further be protected by the construction of berms or low brick walls around their bases. 4. Stockpiles must be kept clear of weeds and alien vegetation growth by regular weeding. 5. Where contamination of soil is expected, analysis must be done prior to disposal of soil to determine the appropriate disposal route. Proof from an approved waste disposal site where contaminated soils are dumped if and when a spillage / leakage occurs must be attained and given to the project manager.		Erosion plan implemented and hydrological measures in place
SPECIFIC MITIGATION MEASURES			
Soils and Geology: Removal of sub-soils	1. Identify protected areas prior to construction. 2. Construction of temporary berms and drainage channels to divert surface water. 3. Minimize earthworks and fills. 4. Use existing road network and access tracks. 5. Rehabilitation of affected areas (such as re-grassing, mechanical stabilization). 6. Correct engineering design and construction of gravel roads and water crossings. 7. Correct construction methods for foundation installations and cut to fill configurations.	Holder of the EA	Impacts avoided or managed as per specialist recommendations. Ensure the conditions of the EA are adhered to. Compliance to all legislative requirements

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
	8. Vehicle repairs to be undertaken in designated areas. 9. Control storm water flow. 10. Dust suppression techniques to be applied.		
Soil: Soil erosion (wind or water) caused by surface disturbance	1. Avoid extensive vegetation removal. 2. Re-vegetate as soon as possible and maintain cover (irrigate if necessary).		Impacts avoided or managed as per specialist recommendations. Ensure the conditions of the EA are adhered to. Compliance to all legislative requirements

8.2.12 Agriculture

This section deals with issues relating to agricultural potential and resources and actions that need to be implemented during construction.

Table 22: Agriculture

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
Agriculture: Soil and Agricultural Potential	1. Avoid any cultivated and especially irrigated areas, if possible. 2. Avoid extensive vegetation removal. 3. Re-vegetate as soon as possible and maintain cover (irrigate if necessary). 4. Undertake periodic monitoring of the immediate vicinity to ensure that no excessive erosion has commenced.	Holder of the EA	Plant Rehabilitation Implemented Erosion plan implemented Periodic monitoring being undertaken and results kept on record

8.2.13 Noise and Vibrations

This section deals with noise issues and actions that need to be implemented during construction.

Table 23: Noise and vibrations

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
Noise and Vibrations	1. The construction phase must aim to adhere to the relevant noise regulations and limit noise to within standard working hours in order to reduce disturbance of dwellings in close proximity to the development. 2. The construction crew must abide by the local by-laws (if applicable) regarding noise. 3. Ensure that noise as a component is included in the induction of employees and contractors, and how their activities and actions can impact on residents in the area (reverse alarms and reversing close to dwellings, driving fast past residential dwellings at night, maintenance of equipment). All contractors and employees must receive this induction. 4. Construction site yards, workshops, concrete batching plants, and other noisy fixed facilities must be located well away from noise sensitive areas. Once the proposed final layouts are made available by the contractor(s), the sites must be evaluated in detail and specific measures designed into the system 5. Truck traffic must be routed away from noise sensitive areas, where possible. 6. Noisy operations must be combined so that they occur where possible at the same time. 7. Construction workers to wear necessary ear protection gear. 8. Noise from labourers must be controlled. 9. The contractor must take measures to discourage labourers from loitering in the area and causing noise disturbance. Where possible labour must be transported to and from the site by the contractor or his Sub-Contractors by the contractors own transport.	Holder of the EA	Noise and lighting managed according to approved Method Statement Ensure the EMPr is adhered to.

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
	10. Implementation of enclosure and cladding of processing plants. 11. When working in very close proximity to potentially sensitive receptors, coordinate the working time with periods when the receptors are not at home where possible. An example would be to work within the 08:00 to 17:00 time-slot to minimize the significance of the impact because: 12. Where possible construction work must be undertaken during normal working hours (07H00 – 17H00), from Monday to Saturday; If agreements can be reached (in writing) with all the surrounding (within a 500m distance) potentially sensitive receptors, these working hours can be extended. 13. The developer must investigate any reasonable and valid noise complaint if registered by a receptor staying within 2,000m from location where construction activities are taking place or operational wind PV. 14. When any noise complaints are received, noise monitoring must be conducted at the complainant, followed by feedback regarding noise levels measured. 15. Reduce the noise impact during the construction phase by: • Using the smallest / quietest equipment for the particular purpose. Ensuring that equipment is well-maintained and fitted with the correct and appropriate noise abatement measures.		

8.2.14 Visual Impact

This section deals with visual issues and actions that need to be implemented during construction

Table 24: Visual Impact

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
Visual Impact: General	1. Construction activities must not occur at night and lighting must only be erected where absolutely necessary.	Holder of the EA	Noise and lighting managed according to approved Method Statement

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
	2. Construction traffic must stick to designated routes or access roads. 3. Construction areas are to be kept clean and tidy. 4. Measures must be taken to suppress dust arising from construction activities. 5. Labour being transported to the site must take cognisance of litter and waste concerns. 6. Equipment being transported to the site must be covered with tarps. 7. Topsoil stockpiles must be well managed and seeded when possible if not utilised within three months. 8. It is recommended that equipment be stored discreetly so as not to increase visual impacts. 9. Construction must be conducted in the shortest possible time in order to reduce visual impacts.		Ensure the EMPr is adhered to. Impacts avoided or managed as per specialist recommendations. Implementation of Alien Invasive Species Management Implementation of Plant Rehabilitation Plan
SPECIFIC MITIGATION MEASURES			
Visual Impact: ▪ Potential alteration of the visual character and sense of place ▪ Potential visual impact on receptors in the study area ▪ Potential visual impact on the night	1. Carefully plan to mimimise the construction period and avoid construction delays. 2. Inform receptors within 500m of the site of the construction programme and schedules. 3. Minimise vegetation clearing and rehabilitate cleared areas as soon as possible. 4. Vegetation clearing should take place in a phased manner. 5. Where possible, re-vegetate all reinstated cable trenches with the same vegetation that existed prior to the cable being laid. 6. Establish erosion control measures on areas which will be exposed for long periods of time. This is to reduce the potential impact heavy rains may have on the bare soil. 7. Suitable buffers of intact natural vegetation should be provided along the perimeter of the development area. 8. Maintain a neat construction site by removing rubble and waste materials regularly. 9. Where possible, underground cabling should be utilised.	Holder of the EA	Noise and lighting managed as per the approved Method Statement for noise and lighting management compiled by the contractor and approved by the engineer and reviewed by ECO Impacts avoided or managed as per specialist recommendations Ensure the EMPr is adhered to

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
time visual environment	10. Make use of existing gravel access roads where possible. 11. Limit the number of vehicles and trucks travelling to and from the construction site, where possible. 12. Ensure that dust suppression techniques are implemented: • on all access roads; • in all areas where vegetation clearing has taken place; • on all soil stockpiles. 13. Restrict construction activities to daylight hours in order to negate or reduce the visual impacts associated with lighting. 14. Restrict vegetation clearance on development sites to that which is required for the correct operation of the facility. 15. Ensure that the PV arrays are not located within 500m of any farmhouses in order to minimise visual impacts on these dwellings. 16. As far as possible, limit the number of maintenance vehicles which are allowed to access the facility. 17. Ensure that dust suppression techniques are implemented on all gravel access roads. 18. As far as possible, limit the amount of security and operational lighting present on site. 19. Light fittings for security at night should reflect the light toward the ground and prevent light spill. 20. If possible, light sources should be shielded by physical barriers (walls, vegetation, or the structure itself); 21. Lighting fixtures should make use of minimum lumen or wattage. 22. Mounting heights of lighting fixtures should be limited, or alternatively foot-light or bollard level lights should be used. 23. If possible, make use of motion detectors on security lighting. 24. The operations and maintenance (O&M) buildings should not be illuminated at night, unless for safety purposes. 25. The O&M buildings should be painted in natural tones that fit with the surrounding environment.		

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
	26. Non-reflective surfaces should be utilised where possible		

8.2.15 Heritage, Archaeological, Palaeontological and Cultural Landscape

This section deals with the impact that the new development has on potential archaeological artefacts on the site.

Table 25: Heritage

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
Heritage	1. Any finds must be reported to the nearest National Monuments office to comply with the National Heritage Resources Act (Act No 25 of 1999) and to DFFE. 2. Local museums as well as the South African Heritage Resource Agency (SAHRA) should be informed if any artefacts are uncovered in the affected area. 3. The contractor must ensure that his workforce is aware of the necessity of reporting any possible historical or archaeological finds to the ECO so that appropriate action can be taken. 4. Any discovered artefacts shall not be removed under any circumstances. Any destruction of a site can only be allowed once a permit is obtained and the site has been mapped and noted. Permits shall be obtained from the South African Heritage Resources Association (SAHRA) should the proposed site affect any world heritage sites or if any heritage sites are to be destroyed or altered. 5. Should any archaeological sites / graves be uncovered during construction, their existence shall be reported to the Project Company and MC immediately.	Holder of the EA	Impacts to heritage resources managed and avoided as far as possible Chance Find Procedure Implemented Heritage Management Plan Implemented

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
SPECIFIC MITIGATION MEASURES			
Heritage & Palaeontology	1. Implement a chance finds procedures to handle any heritage and/or palaeontological resources discovered during construction. 2. Implement recommendation in HIA Report (**Appendix 6D of DBAR**). 3. For sites LD01, LD03, LD04, LD05, LD06 and LD07, LD09, LD10, LD11 LD12 the current 20-meter buffer should be kept in place. 4. It is recommended that an archaeologist monitor the earth moving activities during construction. 5. It is recommended that the burial site LD02 be preserved and a buffer fence of 30 meters constructed around the site. 6. Grave relocation must only be considered as last resort. A detailed relocation process must be followed and it is recommended that an experienced consultant be appointed to manage the relocation process. 7. Heritage site LD13 is older than 60 years and protected under section 34 of the NHRA. It is recommended that the site be documented by means of a layout drawing and photographic documentation after which a destruction permit must be applied for from the North West Provincial Heritage Authority, prior to destruction (if required).	Holder of the EA	Chance Find Procedure Implemented Heritage Management Plan Implemented Earth moving activities during construction monitored by archaeologist and records kept Grave relocation process implemented, if required Experienced consultant appointed to manage grave relocation process, if required Layout drawing and photographic documentation of Heritage site LD13 Proof of destruction permit from the North West Provincial Heritage Authority for Heritage site LD13 (if required)

8.2.16 Social Environment

This section deals with social environment and actions that need to be implemented during construction.

Table 26: Social Environment

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
Social Environment	1. All contact with the affected parties must be courteous at all times. The rights of the affected parties must be respected at all times. 2. A complaints register must be kept on site. Details of complaints must be incorporated into the audits as part of the monitoring process. This must be in carbon copy format, with numbered pages. Any missing pages must be accounted for by the Contractor. 3. Damage to infrastructure must not be tolerated and any damage must be rectified immediately by the Contractor. A record of all damage and remedial actions must be kept on site. 4. Care must be taken not to damage irrigation equipment, lines, channels and crops.	Holder of the EA	Clear communication channels maintained Compliance to all legislative requirements. Ensure the EMPr is adhered to.
SPECIFIC MITIGATION MEASURES			
Social Environment: Economic production	1. Procure inputs from local and domestic suppliers 2. Employ local contractors where possible	Holder of the EA	"Locals first" procurement policy implemented and being adhered to Compliance to all legislative requirements Clear communication channels maintained Ensure the EMPr is adhered to
Social Environment: Employment measured in Full-time Equivalent Enrolment (FTE)-person	1. Employ labour intensive methods 2. Employ local residents and communities 3. Sub-contract to local construction companies 4. Utilise local Suppliers		

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
years			
Social Environment: Cumulative	1. Implement the "locals first" policy 2. Aim to employ the people who have already worked on other similar projects in the area to provide them with an opportunity for long-term employment and to continue developing their skills 3. Apply labour intensive construction methods, where feasible		

8.2.18 Construction Traffic and Access

This section deals with construction traffic and access and actions that need to be implemented during construction

Table 27: Construction Traffic and Access

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
Construction Traffic and Access: Construction traffic	1. Construction routes and required access roads must be clearly defined. 2. A route study is to be undertaken as part of the final traffic transportation plan to confirm the most appropriate route to site. 3. Recommendations of the Storm Water Management Plan must be implemented. 4. All equipment moved onto site or off site during a project is subject to the legal requirements. 5. The Contractor must ensure that all the necessary precautions against damage to the environment and injury to persons are taken in the event of an accident. 6. Stagger component delivery to site. 7. The use of mobile batch plants and quarries in close proximity to the site 8. Staff and general trips should occur outside of peak traffic periods. 9. Regular maintenance of gravel roads by the Contractor during the construction phase and by Client/Facility Manager during operation phase.	Holder of the EA	A traffic management Strategy developed and Implemented throughout the construction and operation phases. Storm Water Management Plan implemented Ensure the EMPr is adhered to.

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
	10. Access of all construction and material delivery vehicles must be strictly controlled, especially during wet weather to avoid compaction and damage to the topsoil structure. 11. Damping down of the un-surfaced roads must be implemented to reduce dust and nuisance. 12. ***In cases where severe water restrictions are imposed, other measures like the use of wetting agents such as chemical stabilisation or "hydromulch", must be considered. In situations where the use of water is necessitated, non-potable water sources are to be utilised.***		
Construction Traffic and Access: Access	1. The main routes on the site must be clearly signposted and printed delivery maps must be issued to all suppliers and Sub-Contractors. 2. Planning of access routes to the site for construction purposes must be done in conjunction with the Contractor and the Landowner. All agreements reached must be documented and no verbal agreements must be made. The Contractor must clearly mark all access roads. Roads not to be used must be marked with a "NO ENTRY for construction vehicles" sign.		A traffic management Strategy developed and Implemented throughout the construction and operation phases.
Construction Traffic and Access: Road Maintenance	1. Where necessary, suitable measures must be taken to rehabilitate damaged areas. 2. Contractors must ensure that access roads are maintained in good condition by attending to potholes, corrugations and storm water damages as soon as these develop. 3. If necessary, staff must be employed to clean surfaced roads adjacent to construction sites where materials have spilt. 4. Recommendations of the Aquatic Ecology report must be taken into consideration in terms of erosion, storm water management, alignment of roads and upgrading of existing river crossings.		A traffic management Strategy developed and Implemented throughout the construction and operation phases.

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
Construction Traffic and Access: General	1. The contractor must meet safety requirements under all circumstances. All equipment transported must be clearly labelled as to their potential hazards according to specifications. All the required safety labelling on the containers and trucks used must be in place. 2. Care for the safety and security of community members crossing access roads must receive priority at all times. 3. Ensure that roadworthy and safety standards are implemented at all times for all construction vehicles. 4. All vehicle drivers must have the relevant licenses of the use of the vehicles and need to strictly adhere to the rules of the road. 5. All solar energy facilities need to adhere to the specific mitigation measures set out in term of road safety and traffic. 6. Trips must be planned to avoid peak hours as far as possible (i.e. 06:00 - 08:00 and 16:00 – 17:00) 7. Management strategies for dust suppression to be implemented and dust generating activities to be suspended during periods of strong winds. 8. Road kill monitoring programme must be established and fences erected where necessary to direct animals to safe road crossings on access roads. 9. Limit the number of vehicles and trucks travelling to and from the construction site, where possible. 10. Unless there are water shortages, ensure that dust suppression techniques are implemented • on all access roads; • in all areas where vegetation clearing has taken place; • on all soil stockpiles.		A traffic management Strategy developed and Implemented throughout the construction and operation phases. Adhere to Health and Safety Regulations

8.2.19 Energy Use

This section deals with energy use and actions that need to be implemented during construction

Table 28: Energy Use

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
Energy Use	1. Energy saving lighting must be implemented across the board. 2. Minimal lighting, while maintaining health and safety regulations, must be kept on during the night operations. 3. Equipment not in use must be switched off and unplugged to save on unnecessary energy costs and carbon footprint.	Holder of the EA	Adhere to Health and Safety Regulations Noise and lighting managed according to approved Method Statement

8.2.20 Employment

This section deals with employment issues and actions that need to be implemented during construction.

Table 29: Employment

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
Employment: Labour	1. The use of labour intensive construction measures must be used where appropriate. 2. Training of labour to benefit individuals.	Holder of the EA	Fair employment practises in place
Employment: Recruitment Plan	1. The majority of unskilled labourers must be drawn from the local market / communities and where possible use must be made of local semiskilled and skilled personnel. 2. Local suppliers to be used where possible. 3. The Project Manager must ensure that all staff working on the proposed project are in possession of a South African Identity Document or a relevant work permit. 4. Ensure adequate advertising in the project community areas, local papers for labour. Adverts are to be placed in each area where the public meetings were conducted namely, Sutherland. 5. Local community key stakeholders must be utilised to source labour where possible.		Maintain a "locals first" recruitment policy as far as possible, reduced social impact from development HIV/AIDS awareness educational program implemented

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
	6. The recruitment process must be equitable and transparent. A concerted effort will be made to guard against nepotism and/or any form of favouritism during the process 7. A record of official complaints by employees is to be maintained 8. Where possible, subcontract to local construction companies 9. Consultation with local authorities is essential so as to manage job creation expectations and ensure that all eligible workers in the primary study area are informed of the opportunities. 10. To ensure that skills are adequately acquired, additional training programmes need to be held during the construction phase to prepare the identified community members to be employed at the next phase, i.e. operational. 11. Initiating the education campaign among the local community (in partnership with the community members already active in the area) focusing on alcohol abuse, drug abuse, HIV/AIDS, STDs, etc. prior to the start of construction and maintaining this campaign throughout the project's duration.		
SPECIFIC MITIGATION MEASURES			
Please refer to **Table 26** above for specialist specific mitigation measures related to Employment.			

8.2.21 Security

This section deals with security and actions that need to be implemented during construction.

Table 30: Security

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
Security	1. A security company must be employed to guard the construction site and monitor access. 2. Labour must be transported to and from the site to discourage loitering in adjacent areas and a possible increase in crime or disturbance. 3. Unsocial activities such as consumption or illegal selling of alcohol, drug utilisation or selling and prostitution on site must	Holder of the EA	All staff members are aware of the EMPr requirements relevant to them Ensure the EMPr is adhered to.

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
	be prohibited. Disciplinary or criminal action must be taken against any persons found to be engaged in such activities. 4. Only pre-approved staff must be permitted to stay in the staff accommodation where staff accommodation is provided. 5. The construction camp site must be fenced, where necessary to prevent any loss or injury to persons during the construction phase. 6. No alcohol / drugs to be present on site. 7. No firearms allowed on site or in vehicles transporting staff to / from site (unless used by security personnel or landowners). 8. Construction staff is to make use of the facilities provided for them, as opposed to ad-hoc alternatives (e.g. fires for cooking, the use of surrounding bush as a toilet facility are forbidden). 9. Trespassing on private / commercial properties adjoining the site is forbidden.		

8.3 Operation Phase

- Develop and implement an Environmental Management System (EMS) for the PV plant and associated infrastructure.
- Compile environmental policies and procedures.
- Manage and report on the PV plant's environmental performance.
- Maintain a register of all known environmental impacts and manage the monitoring thereof.
- Take appropriate action as a result of findings and recommendations in management reviews and audits.
- Conduct internal environmental audits and co-ordinate external environmental audits.
- Conduct annual basis reviews of the EMPr to evaluate its effectiveness.
- Liaise with statutory bodies such as the National and Provincial departments of Forestry, Fisheries and Environment (DFFE) and North West Department of Economic Development, Environment, Conservation and Tourism (DEDECT) on environmental performance and other issues.
- Conduct environmental training and awareness for the employees who operate and maintain the PV plant.
- Liaise with interested and affected parties on environmental issues of common concern.
- Track and control the lodging of any complaints regarding environmental matters.

8.3.1 Rehabilitation and Maintenance and Biodiversity

This section deals with the issues relating to rehabilitation after construction.

Table 31: Rehabilitation and maintenance and Biodiversity

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
Rehabilitation: Rehabilitation	1. A mixture of vegetation seed can be used provided the mixture is carefully selected to ensure the following: • Annual and perennial species are chosen. • Pioneer species are included. • Species chosen will grow in the area under natural conditions. • Root systems must have a binding effect on the soil. • The final product must not cause an ecological imbalance in the area. 2. All natural areas impacted during construction must be rehabilitated with locally indigenous species that were present on the site prior to construction. 3. Rehabilitation must take place in a phased approach as soon as possible.	Holder of the EA	Ensure the EMPr is adhered to. Ensure the conditions of the EA are adhered to. All staff members are aware of the EMPr requirements relevant to them Plant Rescue Plan Implemented Ecological Management Plan Impacts avoided or managed as per specialist recommendations.

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
	4. Rehabilitation must be executed in such a manner that surface run-off will not cause erosion of disturbed areas.		
Rehabilitation: Maintenance	1. The site need to be monitored every three (3) months for the first year to identify the emergence of alien species and any erosion concerns.	Holder of the EA	Alien Plant Management Plan Implemented
Biodiversity: Flora	1. Indigenous vegetation must be maintained and all exotics removed as they appear and disposed of appropriately. 2. Vegetative re-establishment must, as far as possible, make use of indigenous or locally occurring plant varieties within the servitude. 3. Rehabilitation must be executed in such a manner that surface run-off will not cause erosion of disturbed areas during and following rehabilitation. 4. Regular monitoring for alien plants within the development footprint as well as adjacent areas which receive runoff from the new development as there are also likely to be prone to invasion problems. 5. Regular alien clearing must be conducted using the best-practice methods for the species concerned. The use of herbicides must be avoided as far as possible.		Alien Plant Management Plan Implemented Plant Rehabilitation Implemented
Biodiversity: Fauna	1. No faunal species must be harmed by maintenance staff during any routine maintenance. 2. Management of the site must take place within the context of an Open Space Management Plan. 3. The collection, hunting or harvesting of any plants or animals at the site must be strictly forbidden by anyone except landowners or other individuals with the appropriate permits and permissions where required. 4. If any parts of the site need to be lit at night for security purposes, this must be done with downward-directed low-UV type lights (such as most LEDs) as far as possible, which do not attract insects.		Ensure the EMPr is adhered to. Ensure the conditions of the EA are adhered to. All staff members are aware of the EMPr requirements relevant to them Noise and lighting managed according to approved Method Statement A traffic management Strategy developed and Implemented

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
	5. All hazardous materials must be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site must be cleaned up in the appropriate manner as related to the nature of the spill. 6. All vehicles accessing the substation sites and servitude must adhere to a low speed limit (30-40km/h max) to avoid collisions with susceptible species such as snakes and tortoises. 7. If parts of the facility are to be fenced, no electrified strands must be placed within 30cm of the ground as some species such as tortoises are susceptible to electrocution as they do not move away when electrocuted but rather adopt defensive behaviour and are killed by repeated shocks. Alternatively, the electrified strands must be placed on the inside of the fence and not the outside. 8. Erosion management at the site must take place according to the Erosion Management Plan and Rehabilitation Plan. 9. All roads and other hardened surfaces must have runoff control features which redirect water flow and dissipate any energy in the water which will pose an erosion risk. 10. All erosion problems observed must be rectified as soon as possible, using the appropriate erosion control structures and re-vegetation techniques. Any roads that will not be rehabilitated must have runoff control features which redirect water flow and dissipate any energy in the water which will pose an erosion risk. 11. All cleared areas must be re-vegetated with indigenous perennial shrubs and grasses from the local area. These can be cut when dry and placed on the cleared areas if natural recovery is slow.		throughout the construction and operation phases. Erosion plan implemented and hydrological measures in place Storm Water Management Plan implemented. Ecological Management Plan Implemented

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
	12. There must be an integrated management plan for the development area during operation, which is beneficial to fauna and flora.		

8.3.2 Operation and Maintenance

This section deals with the potential impacts that could result from the operation and maintenance of the line and substation.

Table 32: Operation and maintenance

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
Operation and Maintenance: Maintenance	1. All applicable standards, legislation, policies and procedures must be adhered to during operation. 2. Regular ground inspection of the energy facilities must take place to monitor their status	Holder of the EA	Ensure the conditions of the EA are adhered to. Compliance to all legislative requirements
Rehabilitation: Public awareness	1. The emergency preparedness plan must be ready for implementation at all times should an emergency situation arise.		Adhere to Emergency Evacuation Plan

8.3.3 Strom Water Management

This section deals with storm water issues and actions that need to be implemented during operation. Please be advised a Storm Water Management Plan has been compiled by a suitably qualified specialist and has been included as Annexure F.

Table 33: Storm Water Management

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
Storm water Run-off Impacts to Wetlands	1. Any hardstand area or building within 50m proximity to a wetland must have energy dissipating structures in an appropriate location to prevent increased run-off and sediments contained in the run-off entering adjacent areas or wetlands. This can be in the form of hard concrete structures or soft engineering structures (such as grass blocks for example).	Holder of the EA	Ensure the EMPr is adhered to. Ensure the conditions of the EA are adhered to. All staff members are aware of the EMPr requirements relevant to them

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
	2. A suitable operational storm water management design or plan is to be compiled and implemented that accounts for the use of appropriate structures or devices that will prevent increased run-off and sediment entering nearby wetlands.		

8.3.4 Flora

This section deals with floral issues and actions that need to be implemented during operation.

Table 34: Flora

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
Flora: Runoff and erosion due to the presence of hard surfaces that change the infiltration and runoff properties of the landscape	1. Compile and implement a storm water management plan, which highlights control priorities and areas and provides a programme for long-term control. 2. Undertake regular monitoring to detect erosion features early so that they can be controlled.	Holder of the EA	Ensure the EMPr is adhered to. Ensure the conditions of the EA are adhered to. All staff members are aware of the EMPr requirements relevant to them
Flora: Establishment and spread of alien invasive plant species due to the presence of migration corridors and disturbance vectors	1. Compile and implement Alien Invasive Management Plan. 2. Rehabilitate disturbed areas.		Alien Plant Management Plan Implemented
SPECIFIC MITIGATION MEASURES			
Flora: Establishment and spread of alien invasive plant species due to the presence of	1. Compile and implement Alien Invasive Management Plan. 2. Rehabilitate disturbed areas.	Holder of the EA	Alien Plant Management Plan Implemented Biodiversity rehabilitation programme compiled and implemented

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
migration corridors and disturbance vectors			
Flora: Runoff and erosion due to the presence of hard surfaces that change the infiltration and runoff properties of the landscape	1. Compile and implement a storm water management plan, which highlights control priorities and areas and provides a programme for long-term control. 2. Undertake regular monitoring to detect erosion features early so that they can be controlled. 3. Implement control measures. 4. Avoid building on or near steep or unstable slopes. 5. Construct proper culverts, bridges and/or crossings at drainage-line crossings, and other attenuation devices to limit overland flow		Impacts avoided or managed as per specialist recommendations. Storm Water Management Plan compiled and implemented Erosion monitoring being undertaken and results being kept on record Erosion Control Plan compiled and implemented

8.3.5 Fauna

This section deals with faunal issues and actions that need to be implemented during operation.

Table 35: Fauna

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
Fauna	1. Implement traffic control measures, including speed limits. 2. Environmental awareness education for staff and visitors.	Holder of the EA	Impacts avoided or managed as per specialist recommendations Ensure the conditions of the EA are adhered to Compliance to all legislative requirements
SPECIFIC MITIGATION MEASURES			
Fauna: Direct mortality of fauna through traffic,	1. Implement traffic control measures, including speed limits. 2. Environmental awareness education for staff and visitors	Holder of the EA	Traffic control measures implemented

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
illegal collecting, poaching and collisions and/or entanglement with infrastructure			Environmental awareness education for staff and visitors being undertaken and proof of this kept on record

8.3.6 Avifauna

This section deals with avifaunal issues and actions that need to be implemented during operation.

Table 36: Avifauna

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
Avifauna	1. Reduce noise levels as far as possible. 2. Driving should, at all times, remain on existing roads. 3. Speed limits should be implemented for driving, and should not exceed 40km/h. 4. Any new construction activity should be restricted to the immediate footprint of the infrastructure. 5. Access to the remainder of the site should be strictly controlled to prevent unnecessary degradation of habitat. 6. Maximum use should be made of existing access roads and the construction of new roads should be kept to a minimum.	Holder of the EA	Noise and lighting managed according to approved Method Statement A traffic management Strategy developed and Implemented throughout the construction and operation phases.
SPECIFIC MITIGATION MEASURES			
Avifauna: Displacement of priority species due to habitat transformation	1. Activity should be restricted to the immediate footprint of the infrastructure. 2. Access to the remainder of the site should be strictly controlled to prevent unnecessary degradation of habitat. Maximum use should be made of existing access roads and the construction of new roads should be kept to a minimum. 3. The mitigation measures proposed by the vegetation specialist must be strictly enforced. 4. It is recommended that a single perimeter fence is used	Holder of the EA	Mitigation measures proposed by vegetation specialist being strictly enforced Ecological Management Plan compiled and implemented

8.3.7 Air Quality

This section deals with the issues relating to air pollution during operation

Table 37: Air Pollution

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
Air Quality: Dust Management	1. Any dirt roads utilised to access the sites must be regularly maintained and dust mitigation measures to be enforced to ensure that dust levels are controlled.	Holder of the EA	Dust suppression implemented and being undertaken on a continuous basis All waste managed according to approved Method Statement
Air Quality: Litter management	1. Remove unwanted materials and litter on a regular basis to avoid potential odours.		

8.3.11 Aquatic Ecology / Surface Water

This section deals with the issues relating to surface water during operation

Table 38: Aquatic Ecology

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
Aquatic Ecology / Surface Water	1. All stipulated mitigation measures are to be adhered to in order to minimise potential impacts to surface water resources.	Holder of the EA	Key sensitive areas avoided Impacts avoided or managed as per specialist recommendations.
SPECIFIC MITIGATION MEASURES			
Aquatic Ecology / Surface Water: Vehicle Damage to the Wetlands	1. **Minimising Vehicle Damage to the Wetlands** • ***Where access through the wetland is unavoidable and absolutely required, it is recommended that any road plan and associated structures be submitted to the relevant governmental environment and water departments for approval prior to implementation.*** • The access roads that are environmentally authorised and have been permitted in terms of water use licensing in the highly sensitive area will have to be regularly monitored and checked for erosion.	Holder of the EA	Proof of submission of road plan and associated structures to

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
	• Monitoring should be conducted once every month in the rainy season (October to March). Additionally, after short or long periods of heavy rainfall or after long periods of sustained rainfall, the roads will need to be checked on an ad hoc basis for erosion. • Rehabilitation measures will need to be employed should erosion be identified. • Where erosion begins to take place, this must be dealt with immediately to prevent significant erosion damage to the wetland. • Should large scale erosion occur, a rehabilitation plan will be required. Input, reporting and recommendations from a suitably qualified wetland / surface water specialist must be obtained in this respect.		governmental environment and water departments for approval Proof of approval of road plan and associated structures Storm Water Management Plan compiled and implemented Regular monitoring being undertaken and records of this being kept Ensure the EMPr is adhered to
Aquatic Ecology / Surface Water: Storm water Run-off Impacts to Wetlands	2. Any hardstand area or building within 50m proximity to a wetland must have energy dissipating structures in an appropriate location to prevent increased run-off and sediments contained in the run-off entering adjacent areas or wetlands. This can be in the form of hard concrete structures or soft engineering structures (such as grass blocks for example). 3. A suitable operational storm water management design or plan is to be compiled and implemented that accounts for the use of appropriate structures or devices that will prevent increased run-off and sediment entering nearby wetlands.		Erosion plan compiled and implemented and hydrological measures in place Erosion Rehabilitation Plan compiled and implemented (with input from suitably qualified wetland / surface water specialist), should large scale erosion occur Rehabilitation measures implemented, should erosion be identified, and proof of this kept on record

8.3.12 Agriculture

This section deals with issues relating to agricultural potential and resources and actions that need to be implemented during operation.

Table 39: Agriculture

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
Agriculture: Erosion	1. Maintain where possible all vegetation cover and facilitate re-vegetation of denuded areas throughout the site, to stabilize the soil against erosion. 2. Undertake periodic monitoring of the immediate vicinity to ensure that no excessive erosion has commenced.	Holder of the EA	Plant Rehabilitation Implemented Erosion plan implemented
Agriculture: Soil and Agricultural Potential	1. Avoid any cultivated and especially irrigated areas, if possible. 2. Avoid extensive vegetation removal 3. Re-vegetate as soon as possible and maintain cover (irrigate if necessary).		
SPECIFIC MITIGATION MEASURES			
Soil and Agricultural Potential: Loss of agricultural land	1. Avoid any cultivated and especially irrigated areas, if possible.	Holder of the EA	Plant Rehabilitation implemented Erosion Plan compiled and implemented Periodic monitoring being undertaken and results kept on record
Soil and Agricultural Potential: Soil erosion (wind or water) caused by surface disturbance	1. Avoid extensive vegetation removal. 2. Re-vegetate as soon as possible and maintain cover (irrigate if necessary)		
Soil Ecology and Functioning: Proposed project can contribute to overall loss of soil health and productivity	1. Minimise soil disturbance. 2. Re-vegetate all disturbed areas 3. Monitor periodically (6-monthly or seasonally)		

8.3.14 Geotechnical

This section deals with issues relating to soil management actions that need to be implemented during operation.

Table 40: Geotechnical

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
Removal of subsoils (soil, rock)	1. Use of existing roads and tracks. 2. Rehabilitation of affected areas (such as erosion control mats). 3. Correct engineering design and construction of roads and water crossings. 4. Vehicle repairs to be undertaken in designated areas. 5. Maintenance of storm water system.	Holder of the EA	Erosion Plan compiled and implemented Storm Water Management Plan compiled and implemented Rehabilitation Plan compiled and implemented Impacts avoided or managed as per specialist recommendations Ensure the conditions of the EA are adhered to Compliance to all legislative requirements

8.3.15 Visual Impact

This section deals with issues relating to visual receptors and actions that need to be implemented during operation.

Table 41: Visual Impact

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
Visual Impact: Maintenance and lighting	1. The site must be kept clean, tidy and well maintained to reduce negative visual impacts. 2. Rehabilitation of surrounding areas must take place with indigenous species that were present on the site prior to construction. 3. Regular maintenance of the associated infrastructure must be undertaken.	Holder of the EA	Noise and lighting managed according to approved Method Statement All waste managed according to approved Method Statement Plant Rehabilitation Implemented
SPECIFIC MITIGATION MEASURES			
Visual Impact: ▪ Potential alteration of the visual character and sense of place. ▪ Potential visual impact on receptors in the study area. ▪ Potential visual impact on the night time visual environment.	1. Restrict vegetation clearance on the site to that which is required for the correct operation of the facility. 2. Ensure that the PV arrays are not located within 500m of any farmhouses in order to minimise visual impacts on these dwellings. 3. As far as possible, limit the number of maintenance vehicles which are allowed to access the site. 4. Ensure that dust suppression techniques are implemented on all gravel access roads. 5. Only clear vegetation on site and adjacent to the site which is required to be cleared for the correct operation of the facility. 6. As far as possible, limit the amount of security and operational lighting present on site. 7. Light fittings for security at night should reflect the light toward the ground and prevent light spill. 8. If possible, light sources should be shielded by physical barriers (walls, vegetation, or the structure itself); 9. Lighting fixtures should make use of minimum lumen or wattage.	Holder of the EA	Noise and lighting managed according to approved Method Statement

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
	10. Mounting heights of lighting fixtures should be limited, or alternatively, foot-light or bollard level lights should be used. 11. If economically and technically feasible, make use of motion detectors on security lighting. 12. Care should be taken with the layout of the security lights to prevent motorists on the R502 from being blinded by lights. 13. The operations and maintenance (O&M) buildings should not be illuminated at night, unless for safety purposes. 14. The on-site buildings should be painted in natural tones that fit with the surrounding environment. 15. Non-reflective surfaces should be utilised where possible.		

8.3.16 Heritage, Archaeological, Palaeontological and Cultural Landscape

This section deals with the impact that the new development has on potential archaeological artefacts on the site.

Table 42: Heritage

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
Heritage, archaeology and Palaeontology: Chance finds	1. Implement a chance finds procedure to handle any heritage resources discovered. 2. For sites LD01, LD03, LD04, LD05, LD06 and LD07, LD09, LD10, LD11 LD12 the current 20-meter buffer must be kept in place. 3. The burial site LD02 must be preserved and a buffer fence of 30 meters must be maintained around the site	Holder of the EA	Chance Finds Procedure compiled and implemented, where required Buffer areas being maintained and proof of this being kept on record

8.3.17 Social Environment

This section deals with social environment and actions that need to be implemented during operation.

Table 43: Social Environment

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
Social Environment	1. All contact with the affected parties must be courteous at all times. The rights of the affected parties must be respected at all times. 2. Ensure that the expectations (rules) of the farmers regarding access to farms are understood and effectively adhered to. 3. Establish a local skills desk to identify the skills set of the local residents available for the operation phase of the PV. 4. Up-skill construction workers with aptitude to maintain the PV plant.	Holder of the EA	Clear communication channels maintained
SPECIFIC MITIGATION MEASURES			
Social Environment: Economic Production	1. Procure goods and services required for the operation of the plant from the local economy	Holder of the EA	Clear communication channels maintained Social Responsibility Programme implemented
Social Environment: Employment	1. Aim to fill all the positions by labour from the local community. 2. Aim to employ the people who have already worked on other similar projects in the area to provide them with an opportunity for long-term employment and to continue developing their skills 3. Use local suppliers, where feasible		"Locals first" procurement policy implemented and being adhered to Compliance to all legislative requirements

8.4 Decommissioning Phase

Should the proposed developments need to be decommissioned, the same impacts as identified for the construction phase of the proposed development can be anticipated. Similar potential impacts are therefore expected to occur and the stipulated mitigation measures (where relevant) must be employed as appropriate to minimise impacts.

8.4.1 On-going Stakeholder involvement

This is the process that is recommended if the sites are decommissioned.

This section relates to the stakeholder involvement that needs occur during decommissioning.

Table 44: On-going stakeholder involvement

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
Ongoing stakeholder involvement	1. Community to be notified, as culturally appropriate, timeously of the planned decommissioning, e.g.: Proposed decommissioning start date; and Process to be followed. 2. Recommend that a meeting with community leader(s) be held before decommissioning commence to inform them: • What activities will take place during the decommissioning phase. • How these activities will impact upon the communities and/or their properties. • Regarding the timeframes of scheduled activities 3. Regular interaction between Holder of the EA and community leader(s) during the decommissioning phase 4. A reporting office / channel to be established must community members experience problems with contractors / sub-contractors during the decommissioning phase. 5. A register to be kept of problems reported by community members and the steps taken to address / resolve it.	Holder of the EA	Clear communication channels maintained

8.4.2 Construction Site Decommissioning

This section deals with the demolishing of the construction camp and the actions that need to be implemented.

Table 45: Construction Site Decommissioning

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
Construction Site Decommissioning: Removal of equipment	1. All structures comprising the construction camp are to be removed from site apart from what may be required for the operation of the facility. 2. The area that previously housed the construction camp is to be checked for spills of substances such as oil, paint etc., and these must be cleaned up. 3. All hardened surfaces within the construction camp area must be ripped, all imported materials removed, and the area must be top soiled and regressed using the guidelines set out in the re-vegetation plan that forms part of this document.	Holder of the EA	Compliance to all legislative requirements. Ensure the EMPr is adhered to. Alien Plant Management Plan Implemented Plant Rehabilitation Implemented
Construction Site Decommissioning: Temporary services	1. The Contractor must arrange the cancellation of all temporary services. 2. Temporary roads must be closed and access across these, blocked. 3. All areas where temporary services were installed are to be rehabilitated to the satisfaction of the ECO.		Clear communication channels maintained A traffic management Strategy Implemented Alien Plant Management Plan Implemented Plant Rehabilitation Implemented
Construction Site Decommissioning: Associated Infrastructure	1. Surfaces are to be checked for waste products from activities such as concreting or asphalting and cleared in a manner approved by the Engineer. 2. All surfaces hardened due to construction activities are to be ripped and imported material thereon removed. 3. All rubble is to be removed from the site to an approved disposal site as approved by the ECO. Burying of rubble on site is prohibited.		All waste managed according to approved Method Statement

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
	4. Refueling, handling of hydrocarbon products or maintenance and servicing of heavy earthmoving vehicles must not take place over bare soil or within 32m of any on-site watercourses. All vehicle maintenance or re-fuelling must be done off-site, or alternatively, in a designated (hard or impermeable surface) area on-site. 5. The site is to be cleared of all litter. 6. The Contractor is to check that all watercourses are free from building rubble, spoil materials and waste materials. 7. Fences, barriers and demarcations associated with the construction phase are to be removed from the site unless stipulated otherwise by the Engineer. 8. All residual stockpiles must be removed to spoil or spread on site as directed by the Engineer. 9. The Contractor must repair any damage that the construction works has caused to neighbouring properties, specifically, but not limited to, damage caused by poor storm water management.		
Construction Site Decommissioning: Rehabilitation plan	1. Rehabilitate and re-vegetate cleared areas with indigenous plant species that were present on the site prior to construction. 2. All roads utilized during the construction phase must be rehabilitated to an acceptable standard after construction is complete.		Alien Plant Management Plan Implemented Plant Rehabilitation Implemented

8.4.3 Community Health and Safety

This section deals with the issues relating to health and safety during decommissioning.

Table 46: Community Health and Safety

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
On-going stakeholder involvement	1. Demarcated routes to be established for construction vehicles to ensure the safety of communities, especially in terms of road safety and communities to be informed of these demarcated routes. 2. Excavated areas to be fenced off and regularly inspected to ensure that humans and animals do not have access to the site. 3. Where dust is generated by trucks passing on gravel roads, dust mitigation measures to be enforced. 4. Any infrastructure that would not be decommissioned must be appropriately locked and/or fenced off to ensure that it does not pose any danger to the community	Holder of the EA	A traffic management Strategy Implemented Ensure the EMPr is adhered to.

8.4.4 Waste Management

This section deals with the issues relating to waste management during decommissioning

Table 47: Waste Management

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
Waste Management	1. All decommissioned equipment must be removed from site and disposed of at a registered land fill. Records of disposal must be kept. 2. All waybills and disposal slips (e.g. safe disposal certificates, waste manifests) must be retained for a minimum period of five (5) years for the disposal activities associated with the construction and decommissioning of the proposed facility, per regulation 8(1) of the NEM:WA, 2008 Waste Classification and Management Regulations published in GN No. R. 634 of 23 August 2013.	Holder of the EA	All waste managed according to approved Method Statement

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
	3. Components of the solar PV plant must be recycled, where possible.		

8.4.5 Biodiversity

This section deals with the issues relating to biodiversity during decommissioning.

Table 48: Biodiversity

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
Biodiversity: Fauna	1. All hazardous materials must be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site must be cleaned up in the appropriate manner as related to the nature of the spill. 2. All vehicles accessing the site must adhere to a low speed limit (30-40km/h max) to avoid collisions with susceptible species such as snakes and tortoises. 3. No excavated holes or trenches must be left open for extended periods as fauna may fall in and become trapped. 4. All above-ground infrastructure must be removed from the site. Below-ground infrastructure such as cabling can be left in place if it does not pose a risk, as removal of such cables must generate additional disturbance and impact, however, this must be in accordance with the decommissioning and recycling plan, and as per the agreements with the land owners concerned.	Holder of the EA	All waste managed according to approved Method Statement A traffic management Strategy Implemented Ensure the EMPr is adhered to.
Biodiversity: Erosion control	1. There must be regular monitoring for erosion for at least 2 years after decommissioning by the Holder of the EA to ensure that no erosion problems develop as a result of the disturbance, and if they do, to immediately implement erosion control measures.		Erosion plan implemented and hydrological measures in place Alien Plant Management Plan Implemented

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
	2. All erosion problems observed must be rectified as soon as possible, using the appropriate erosion control structures and re-vegetation techniques. 3. All disturbed and cleared areas must be re-vegetated with indigenous perennial shrubs and grasses from the local area. 4. Implement a storm water management plan, which highlights control priorities and areas and provides a programme for long-term control. 5. Implement any control measures that may become necessary. 6. Avoid undertaking any activities on or near steep or unstable slopes.		Plant Rehabilitation Implemented
Biodiversity: Alien invasive plant control	1. Wherever excavation is necessary for decommissioning, topsoil must be set aside and replaced after construction to encourage natural regeneration of the local indigenous species. 2. Due to the disturbance at the site alien plant species are likely to be a long-term problem at the site following decommissioning and regular control will need to be implemented until a cover of indigenous species has returned. 3. Regular monitoring for alien plants within the disturbed areas early on for at least two years after decommissioning or until alien invasives are no longer a problem at the site. 4. Regular alien clearing must be conducted using the best-practice methods for the species concerned. The use of herbicides must be avoided as far as possible 5. Implement an alien management plan, which highlights control priorities and areas and provides a programme for long-term control. 6. Post-decommissioning monitoring should continue for an appropriate length of time to ensure that future problems are avoided.		Alien Plant Management Plan Implemented Plant Rehabilitation Implemented

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
	7. Do NOT use any alien plants during any rehabilitation that may be required.		
SPECIFIC MITIGATION MEASURES			
Vegetation: Loss and disturbance of natural vegetation due to the removal of infrastructure and need for working sites	1. No additional clearing of vegetation should take place without a proper assessment of the environmental impacts and authorization from relevant authorities. 2. If any additional infrastructure needs to be constructed, for example overhead power lines, communication cables, etc., then these must be located next to existing infrastructure, and clustered to avoid dispersed impacts (granted the necessary approvals have been obtained / are in place). 3. No driving of vehicles off-road. 4. Implement Alien Plant Management Plan, including monitoring, to ensure minimal impacts on surrounding areas. 5. Access to sensitive areas outside of development footprint should not be permitted during operation. 6. Surface runoff and erosion must be properly controlled and any issues addressed as quickly as possible.	Holder of the EA	Ensure the conditions of the EA are adhered to. Ensure the EMPr is adhered to. Noise and lighting managed according to approved Method Statement Alien Plant Management Plan Implemented Plant Rehabilitation Implemented A traffic management Strategy Implemented Storm Water Management Plan compiled and implemented
Fauna: Direct mortality of fauna due to machinery, construction and increased traffic	1. Personnel and vehicles to avoid sensitive habitats. 2. No speeding on access roads – install speed control measures, such as speed humps, if necessary 3. No illegal collecting of any individuals, particularly the Armadillo Girdled Lizard. 4. No hunting of protected species or hunting of any other species without a valid permit. 5. Personnel to be educated about protection status of species, including distinguishing features to be able to identify protected species. 6. Report any sitings to conservation authorities. Prevent unauthorised access to the site – project roads provide access to remote areas that were not previously easily accessible for illegal collecting or hunting		

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
Fauna: Displacement and/or disturbance of fauna due to increased activity and noise levels	1. Restrict impact to development footprint only and limit disturbance spreading into surrounding areas. 2. Access to sensitive areas outside of infrastructure footprint should not be permitted during construction. 3. No speeding on access roads – install speed control measures, such as speed humps, if necessary 4. No hunting of protected species. 5. Personnel to be educated about protection status of species, including distinguishing features to be able to identify protected species. 6. Report any sitings to conservation authorities		
Vegetation: Continued establishment and spread of alien invasive plant species due to the presence of migration corridors and disturbance vectors	1. Implement an alien management plan, which highlights control priorities and areas and provides a programme for long-term control. 2. Undertake regular monitoring to detect alien invasions early so that they can be controlled. 3. Post-decommissioning monitoring should continue for an appropriate length of time to ensure that future problems are avoided. 4. Do NOT use any alien plants during any rehabilitation that may be required.		
Vegetation: Continued runoff and erosion due to the presence of hard surfaces that change the infiltration and runoff properties of the landscape	1. Implement a storm water management plan, which highlights control priorities and areas and provides a programme for long-term control. 2. Following decommissioning, undertake regular monitoring for an appropriate length of time to detect erosion features early so that they can be controlled. 3. Implement any control measures that may become necessary. 4. Avoid undertaking any activities on or near steep or unstable slopes.		

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
Avifauna: Displacement of priority species due to disturbance associated with de-commissioning of the PV plant and associated infrastructure	1. Decommissioning activity should be restricted to the immediate footprint of the infrastructure. 2. Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of priority species. 3. Measures to control noise and dust should be applied according to current best practice in the industry. 4. Maximum used should be made of existing access roads and the construction of new roads should be kept to a minimum. 5. The mitigation measures proposed by the vegetation specialist (see above) must be strictly enforced.	Holder of the EA	Impacts avoided or managed as per specialist recommendations Dust suppression implemented and undertaken on a regular basis Noise managed according to approved Method Statement Ecological Management Plan compiled and implemented Ensure the EMPr is adhered to Ensure the conditions of the EA are adhered to Compliance to all legislative requirements

8.4.6 Aquatic Ecology / Surface Water

This section deals with the issues relating to Aquatic Ecology / Surface Water Resources during decommissioning.

Should the proposed development need to be decommissioned, the same impacts as identified for the construction phase of the proposed development can be anticipated. **The stipulated mitigation measures in Table 15 of this EMPr (where relevant) must therefore be employed as appropriate to minimise impacts during the decommissioning phase.**

8.4.7 Agriculture

This section deals with issues relating to agricultural potential and resources and actions that need to be implemented during decommissioning.

Table 49: Agriculture

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
Agriculture: Soil erosion	1. Implement an effective system of run-off control, where it is required, that collects and safely disseminates run-off water from all hardened surfaces and prevents potential down slope erosion. Any occurrences of erosion must be attended to immediately and the integrity of the erosion control system at that point must be amended to prevent further erosion from occurring there. 2. Maintain where possible all vegetation cover and facilitate re-vegetation of denuded areas throughout the site, to stabilize the soil against erosion. 3. Undertake periodic monitoring of the immediate vicinity to ensure that no excessive erosion has commenced.	Holder of the EA	Erosion Plan compiled and implemented Alien Plant Management Plan compiled and implemented Plant Rehabilitation Plan compiled and implemented
Agriculture: Soil and Agricultural Potential	1. Minimise soil disturbance 2. Re-vegetate all disturbed areas and monitor periodically (6-monthly or seasonally)		Plant Rehabilitation Plan compiled and implemented Erosion plan compiled and implemented Monitoring being undertaken and results being kept on record
SPECIFIC MITIGATION MEASURES			
Agriculture: Soil and Agricultural Potential	1. Avoid any cultivated and especially irrigated areas, if possible. 2. Avoid extensive vegetation removal. 3. Re-vegetate as soon as possible and maintain cover (irrigate if necessary)	Holder of the EA	Re-vegetation and Habitat Rehabilitation Plan compiled and implemented Erosion plan compiled and implemented

8.4.8 Geotechnical

This section deals with issues relating to soil management actions that need to be implemented during decommissioning.

Table 50: Geotechnical

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
Soils and Geology: Removal of subsoils (soil, rock)	1. Use of temporary berms and drainage channels to divert surface water where feasible. 2. Minimize earthworks and demolish footprints. 3. Use of existing roads and tracks were feasible. 4. Rehabilitation of affected areas (such as re-grassing). 5. Develop a chemical spill response plan. 6. Develop dust and demolition fly suppression plan. 7. Vehicle repairs to be undertaken in designated areas. 8. Reinstate channelized drainage features.	Holder of the EA	Erosion Plan implemented Rehabilitation Plan compiled and implemented Chemical Spill Response Plan compiled and implemented Dust and Demolition Fly Suppression Plan compiled and implemented

8.4.9 Visual Impact

This section deals with visual issues and actions that need to be implemented during decommissioning

Table 51: Visual Impact

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
Visual Impact: General	1. Decommissioning activities must not occur at night and lighting must only be erected where absolutely necessary. 2. Decommissioning traffic must stick to designated routes or access roads. 3. Decommissioning areas are to be kept clean and tidy. 4. Measures must be taken to suppress dust arising from decommissioning activities. 5. Labour being transported to the site must take cognisance of litter and waste concerns. 6. Equipment being transported to and from the site must be covered with tarps. 7. Topsoil stockpiles must be well managed and seeded when possible if not utilised within three months. 8. It is recommended that equipment be stored discreetly so as not to increase visual impacts.	Holder of the EA	Noise and lighting managed according to approved Method Statement A traffic management strategy implemented All staff members are aware of the EMPr requirements relevant to them Erosion Plan compiled and implemented

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
	9. Decommissioning must be conducted in the shortest possible time in order to reduce visual impacts.		Alien Plant Management Plan Implemented Plant Rehabilitation Plan compiled and implemented
SPECIFIC MITIGATION MEASURES			
Visual intrusion from decommissioning: ▪ Potential visual intrusion resulting from vehicles and equipment involved in the decommissioning process ▪ Potential visual impacts of increased dust emissions from decommissioning activities and related traffic ▪ Potential visual intrusion of any remaining infrastructure on the site	1. All infrastructure that is not required for post-decommissioning use should be removed. 2. Carefully plan to minimize the decommissioning period and avoid delays. 3. Maintain a neat decommissioning site by removing rubble and waste materials regularly. 4. Ensure that dust suppression procedures are maintained on all gravel access roads throughout the decommissioning phase. 5. All cleared areas should be rehabilitated as soon as possible. 6. Rehabilitated areas should be monitored post-decommissioning and remedial actions implemented as required.	Holder of the EA	Noise and lighting managed according to approved Method Statement A traffic management Strategy Implemented All staff members are aware of the EMPr requirements relevant to them

8.4.10 Air Quality

This section deals with the issues relating to air quality during decommissioning.

Table 52: Air Pollution

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
Air quality	1. Regular maintenance of equipment to ensure reduced exhaust emissions	Holder of the EA	Ensure the EMPr is adhered to.

8.4.11 Heritage, Archaeological, Palaeontological and Cultural Landscape

Should the proposed development need to be decommissioned, the same impacts as identified for the construction phase of the proposed development can be anticipated. **The stipulated mitigation measures in Table 25 of this EMPr (where relevant) must therefore be employed as appropriate to minimise impacts during the decommissioning phase.**

8.4.12 Social Environment

This section deals with social environment and actions that need to be implemented during decommissioning.

Table 53: Social Environment

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
Social Environment: Loss of agricultural production	1. Rehabilitation of land should take place at the end of the project's life to allow for the land to be used for commercial livestock farming after the project's closure.	Holder of the EA	Clear communication channels maintained Social Responsibility Programme compiled and implemented

8.4.13 Transportation

This section deals with the issues relating to traffic and transportation during decommissioning.

Table 54: Traffic and Transportation impacts

Impact	Impact Management Actions	Responsibility	Impact Management Outcome
Traffic Congestion, Air Quality and Noise Pollution	1. Stagger component removal from site 2. Reduce the decommissioning period as far as possible 3. Staff and general trips should occur outside of peak traffic periods. 4. Regular maintenance of gravel roads.	Holder of the EA	Ensure the EMPr is adhered to. Ensure Traffic Management Plan is adhered to.

9 ADDITIONAL MANAGEMENT PLANS

9.1 Alien Invasive Management Plan

Table 55: Alien Invasive Management Plan for construction phase

ALIEN INVASIVE MANAGEMENT PROGRAMME	
MITIGATION MEASURES	1. Stockpiles must be kept clear of weeds and alien vegetation growth by regular weeding. 2. Alien vegetation and the spread of exotic species on the site will need to be controlled. 3. The contractor must be responsible for implementing a programme of weed control (particularly in areas where soil has been disturbed); and grassing of any remaining stockpiles to prevent weed invasion. 4. Herbicide use must only be allowed according to contract specifications. The application must be according to set specifications and under supervision of a qualified technician. The possibility of leaching into the surrounding environment must be properly investigated and only environmentally friendly herbicides must be used. 5. The use of pesticides and herbicides must be discouraged as these can impact on important pollinator species of indigenous vegetation. 6. Six monthly checks of the area must take place for the emergence of invader species. 7. Mitigation measures mentioned for the construction phase above must be implemented for any maintenance of the development that must be undertaken during the operation phase. 8. Correct rehabilitation with locally indigenous species. 9. Monitoring programme to ensure that rehabilitation efforts are successful to ensure that risks such as erosion, spread of exotic species and the edge effect are avoided. 10. Constant maintenance of the area to ensure re-colonisation of floral species. 11. Regular removal of alien species which will jeopardise the proliferation of indigenous species.

The above Alien Invasive Management Plan will be updated by a suitably qualified vegetation specialist once the detailed design stages of the proposed development are complete and the floral walk-though study has been undertaken (if required).

9.2 Plant Rescue and Protection Plan

Table 56: Plant Rescue and Protection Plan

PLANT RESCUE PROTECTION PLAN	
MITIGATION MEASURES	1. The removal of protected plant species from the proposed development areas must take place prior to construction commencing. These plant species should be grown ex-situ and then relocated after construction has been completed.

PLANT RESCUE PROTECTION PLAN	
	2. Where possible, preference be given to conservation organisations to remove seeds, cuttings and plants prior to construction commencing for conservation purposes. 3. A large proportion of the impact of the development stems from the access roads and the number of roads must be reduced to the minimum possible and routes must also be adjusted to avoid areas of high sensitivity as far as possible, as informed by a preconstruction walk-though survey. 4. Pre-construction environmental induction for all construction staff on site to ensure that basic environmental principles are adhered to. This includes topics such as no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, minimizing wildlife interactions, remaining within demarcated construction areas etc. 5. A pre-construction walk-through survey by the biodiversity specialist will be required during a favourable season to locate any protected plants / trees and/or sensitive species and/or ecological feature. This survey must cover the footprint of all proposed infrastructure, including internal access roads. If necessary, shift infrastructure to avoid impacts on species or specific features. 6. Vegetation clearing must only commence after the walk-through has been conducted and necessary permits obtained. 7. Vegetation clearing to be kept to a minimum. No unnecessary vegetation to be cleared. 8. Vegetation to be removed as it becomes necessary rather than removal of all vegetation throughout the site in one step. 9. Materials must not be delivered to the site prematurely which could result in additional areas being cleared or affected. 10. No vegetation to be used for firewood. 11. Gathering of firewood, fruit, “muti” plants, or any other natural material onsite or in areas adjacent to the site is prohibited unless with prior approval of the ECO. 12. Only vegetation within the footprint must be removed. 13. Vegetation removal must be phased in order to reduce impact of construction. 14. Construction site office and laydown areas must be clearly demarcated and no encroachment must occur beyond demarcated areas. 15. All natural areas impacted during construction must be rehabilitated with locally indigenous plant species. 16. A buffer zone must be established in areas where construction will not take place to ensure that construction activities do not extend into these areas. 17. Construction areas must be well demarcated and these areas strictly adhered to. 18. The use of pesticides and herbicides in the study area must be discouraged as these impacts on important pollinator species of indigenous vegetation. 19. Soils must be kept free of petrochemical solutions that must be kept on site during construction. Spillage can result in a loss of soil functionality thus limiting the re-establishment of flora. 20. Soil stockpiles must not become contaminated with oil, diesel, petrol, garbage or any other material, which must inhibit the later growth of vegetation in the soil.

The above Plant Recue and Protection Plan will be updated by a suitably qualified vegetation specialist once the detailed design stages of the proposed development are complete and the floral walk-though study has been undertaken (if required).

9.3 Re-Vegetation and Habitat Rehabilitation Plan

Table 57: Re-Vegetation and Habitat Rehabilitation Plan

RE-VEGETATION AND HABITAT REHABILITATION PLAN	
MITIGATION MEASURES	1. Re-vegetation must aim to accelerate the natural succession processes so that the plant community develops in the desired way, i.e. promote rapid vegetation establishment. 2. Re-vegetation of disturbed surfaces must occur immediately after construction activities are completed. This must be done through seeding with indigenous grasses. 3. Re-vegetation of the disturbed site is aimed at approximating as near as possible the natural vegetative conditions prevailing prior to construction. 4. All natural areas impacted during construction must be rehabilitated with locally indigenous species typical of the representative botanical unit. 5. Rehabilitation must take place in a phased approach as soon as possible. 6. Rehabilitation process must make use of species indigenous to the area. Seeds from surrounding seed banks can be used for re-seeding. 7. Rehabilitation must be executed in such a manner that surface run-off will not cause erosion of disturbed areas. 8. Planting of indigenous tree species in areas not to be cultivated or built on must be encouraged. 9. Habitat destruction must be limited to what is absolutely necessary for the construction of the infrastructure, including the construction of new roads. In this respect, the recommendations from the Ecological Specialist Study must be applied strictly. Personnel must be adequately briefed on the need to restrict habitat destruction, and must be restricted to the actual construction area. 10. Monitoring programme to ensure that rehabilitation efforts are successful to ensure that risks such as erosion, spread of exotic species and the edge effect are avoided.

The above Re-Vegetation and Habitat Rehabilitation Plan will be updated by a suitably qualified vegetation specialist once the detailed design stages of the proposed development are complete and the floral walk-though study has been undertaken.

9.4 Storm Water Management Plan

A Storm Water Management Plan has been compiled by a suitably qualified specialist and has been included as **Annexure F.**

9.5 Wetland Rehabilitation Plan

A Wetland Rehabilitation Plan has been compiled by a suitably qualified specialist and has been included as **Annexure G**.

9.6 Traffic Management Plan

Table 58: Traffic Management Plan

TRAFFIC MANAGEMENT PLAN	
MITIGATION MEASURES	1. A designated transport coordination manager must be appointed to oversee and manage the traffic safety officers. Additionally, the designated transport coordination manager must inform and keep up-to-date the interested and affected parties of all the activities taking place that will have a direct impact on them. 2. A traffic safety officer must be nominated to make all the necessary arrangements to maintain the required traffic measures for the duration of the project. The safety officer must liaise daily with the transportation coordination manager to keep them apprised of the state of all the traffic arrangements. 3. All construction traffic must comply with the legal load requirements as outlined in the National Road Traffic Act and National Road Traffic Regulations. 4. During periods of high construction traffic entering and exiting the site, it is recommended that flagmen help direct the traffic. This will enable the safe movement of construction and public traffic at the entrance and reduce the number of potential conflicts. 5. The South African Road Traffic Signs Manual (SARTSM), Volume 2, June 1999 is to be used for all traffic during the construction activities of the proposed project. 6. Any damage caused by the construction vehicles to the existing road infrastructure must be repaired in kind, prior to the completion of the project. 7. A dust suppression system for the gravel roads must be in place to prevent excessive dust from the traffic polluting the air. 8. All abnormal loads must be transported under a permit. 9. A route study be undertaken to confirm the most appropriate route to site. 10. The appropriate load permits be obtained from the North West Department of Transport prior to construction.

9.7 Transportation Management Plan

Table 59: Transportation Management Plan

TRANSPORTATION MANAGEMENT PLAN	
MITIGATION MEASURES	1. For each convoy of abnormal vehicles / loads a designated safety officer must be nominated. 2. All vehicles used during the transport of materials and in the construction activities are required to be roadworthy per the National Road Traffic Act (NRTA) and display all pertinent certificates as required. 3. For any vehicles that operate under an exemption permit, a roadworthy certificate will not be required; however, the exemption permit will require that the vehicle is fit for operation on public roadways. 4. All vehicles travelling to and from the site must adhere to all laws imposed by the law enforcement agencies, and must comply with any requests made by the law enforcement officials. 5. All construction vehicles that are entering the site must also be available via radio or telephone communication to the transport coordination manager. So that in the event of an emergency, all vehicles can be accounted for. 6. During the delivery of the PV components and associated infrastructure, the person in charge must be in communication with transport coordination manager, so that he/she will keep track and document the progress of the vehicles to facilitate any issues that may arise during the transportation phase. 7. All vehicles must comply with the posted speed limits on public roads as well as the speed limits within the development. 8. All abnormal vehicles and loads to be transported are required to have a valid permit before any trip is begun. 9. SANRAL will need to be contacted in order to obtain consent for the abnormal load transport on their roadways. 10. An escort is required to accompany the abnormal vehicle to warn the normal travelling public and to promote the safe flow of traffic if the normal flow of traffic is disrupted by the abnormal vehicle. 11. Construction vehicles delivering raw materials to the site must be covered to prevent any debris along the roads. 12. Ensure a large portion of vehicles traveling to and from the proposed development site travel in the 'off peak' periods. 13. Implement pedestrian safety initiatives. 14. Trucks must stop at regular intervals to allow queuing vehicles to pass.

A consolidated Traffic and Transport Management Plan, taking into account the final route selection must be prepared once the Project advances to the preliminary phase. This plan must ensure that vehicles arrive in a dispersed manner throughout the day to reduce the impact to other road users. Methods to improve driver safety must also be outlined [e.g. the use of speed cameras or Average Speed Over Distance (ASOD)]. Furthermore, this plan must include measures to minimise the impact on local commuters so as not to disturb existing retail and commercial operations.

9.8 Heritage Management Plan

A Heritage Management Plan which contains general management guidelines has been provided in **Annexure E**.

9.9 Environmental Awareness Plan

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

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

9.9.1 Policy on Environmental Awareness

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

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

9.9.2 Implementation of Environmental Awareness

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

Environmental awareness will be fostered in the following manner:

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

9.9.3 Training and awareness

The main contractor is to take responsibility for the management of their staff and subcontractors on the project site during the construction phase and supervise them closely at all times. The onus is on the contractor to make sure that all their staff and subcontractors fully comprehend the contents of the EMPr.

The contractor must organise environmental awareness training programmes, which should be targeted at the two levels of employee: management and labour.

9.9.4 Training of construction workers

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

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

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

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

10 CONCLUSION

The environmental and social impacts of the project were identified through the four (4) project phases [pre-construction (planning and design phase), construction, operation and decommissioning] in compliance with National Environmental Management Act, 1998 (Act 107 of 1998) (NEMA) (as amended) and the EIA Regulations 2014 (as amended).

No fatal flaws have been found for the proposed project. No unacceptable negative impacts have been identified that cannot be reduced to acceptably low levels with the implementation of the proposed mitigation and management measures. Both positive and negative project impacts have been identified.

The EAP is satisfied that the EMPr is in compliance with NEMA (as amended) and the EIA Regulations 2014 (as amended)

ANNEXURE A
CURRICULUM VITAE

CURRICULUM VITAE

Name	Mark Summers
Profession	Environmental Scientist
Name of Firm	SiVEST SA (Pty) Ltd
Present Appointment	Environmental Consultant
Years with Firm	2 Years
Date of Birth	15 December 1990, Pietermaritzburg, South Africa
Nationality	South African
I.D. No.	9012155010081

Education

- National Senior Certificate, Maritzburg College, 2004-2008

Professional Qualifications

- B.Sc. (Ecological Sciences), University of KwaZulu-Natal PMB, KZN (2013)
- B.Sc. Honours (Zoology), University of KwaZulu-Natal PMB, KZN (2014)
- M.Sc. (Ecological Sciences), University of KwaZulu-Natal PMB, KZN (2016)

Membership to Professional Societies

- South African Council for Natural Scientific Professions (SACNASP) Can.Sci.Nat. Reg No. 120309 (2019)
- International Association for Impact Assessment South Africa (IAIAsa)

Employment Record

Jan 2018 – date	SiVEST SA (Pty) Ltd: Trainee Environmental Consultant
Oct 2016 – Dec 2017	JG Afrika (Pty) Ltd: Environmental Consultant
Feb 2016 – Jun 2016	SAEON: Plant community data entry and GIS analyst
Jan 2011	Ezemvelo KZN Wildlife: GIS Groundtruthing in Northern KZN

Language Proficiency

LANGUAGE	SPEAK	READ	WRITE
English	Fluent	Fluent	Fluent
Afrikaans	Good	Good	Good

Years of Working Experience : 4 years

Countries of Work Experience

- South Africa

Fields of Specialisation

- Basic Assessments
- Environmental Compliance Monitoring
- Water Use Licence Applications
- Faunal Identification
- Avifaunal Identification

- Grass Identification
- Tree Identification
- GIS analysis (QGIS and ARCGIS)
- Statistical Analysis (SPSS, STATISTICA)

Overview

Mark has completed a Bachelor of Science Degree in Ecological Science (UKZN, PMB), a Bachelor of Science (Honours) Degree in Zoology (UKZN, PMB) and a Master of Science Degree (PMB) in Ecological Sciences with a focus on Population and Nesting Ecology of Nile crocodiles in Pongolapoort Dam. Additionally, Mark has been involved in plant community data capture and GIS analysis in the Drakensburg region of KwaZulu-Natal. He has attended the SASS 5 Aquatic Biomonitoring Course held by Groundtruth. Mark has been involved in Consulting since October 2016, with a focus on Environmental Compliance and Basic Assessments in the Eastern Cape Province and KwaZulu-Natal. He has conducted assessments in the Biodiversity sector, with hopes of specialising in this field.

Projects Experience (by Sector)

ENVIRONMENTAL AUDITING / ENVIRONMENTAL CONTROL OFFICER

- Nongoma TVET Campus ECO : Aveng Grinaker c/o MSW Consulting *(Current)*
- Kwagqikazai TVET Campus ECO : Fikile Construction c/o MSW Consulting *(Current)*
- Msinga TVET Campus ECO : Base Major Construction c/o MSW Consulting *(Current)*
- Greytown TVET Campus ECO : Motheo Construction c/o MSW Consulting *(Current)*
- Driefontein Water Pipeline ECO: WRK Consulting *(Current)*
- Trustfeeds Waste Water Treatment Works ECO: Umgeni Water *(Current)*
- Construction of the Kokstad Stadium Sports Complex ECO: Greater Kokstad Municipality *(Current)*
- Middledrift SSA 5 – 3 Water Supply Scheme ECO: King Cetshwayo District Municipality c/o SiVEST Civil Engineering *(Current)*
- Middledrift SSA 5 (Emergency Line) Water Supply Scheme ECO: King Cetshwayo District Municipality c/o SiVEST Civil Engineering *(Current)*
- Sumitomo Rubber Rehabilitation Close Out Report: Sumitomo Rubber *(Completed October 2018)*
- Fitty Park Community Water Supply Scheme ECO: Uthukela District Municipality c/o SiVEST Civil Engineering *(Completed August 2018)*

BASIC ASSESSMENTS / ENVIRONMENTAL IMPACT ASSESSMENTS

- Dannhauser Bulk Water Supply Scheme: SiVEST Consulting Engineers *(Completed June 2019)*
- Chansbury Poultry Houses Basic Assessment: Chansbury Farming Trust *(Completed January 2020)*
- Gluckstaadt Water Supply Scheme Basic Assessment: Zululand District Municipality c/o SiVEST Civil Engineering *(Current)*

WATER USE LICENCE APPLICATIONS

- Menlyn Main WULA: Growthpoint Properties *(Current)*
- 50 Wierda Road WULA: Growthpoint Properties *(Current)*
- 151 on 5th WULA: Growthpoint Properties *(Current)*
- Riviera Office Park WULA: Growthpoint Properties *(Current)*
- 8 Rivonia Road WULA: Growthpoint Properties *(Current)*
- Dannhauser Bulk Water Supply Scheme, Amajuba District Municipality *(Current)*
- Growthpoint Properties Borehole Registration WULA: Growthpoint Properties *(May 2019)*
- Gluckstaadt Water Supply Scheme WULA: Zululand District Municipality c/o SiVEST Civil Engineering *(Current)*
- Manyoni WULA Audit: Manyoni Private Game Reserve *(Completed January 2020)*
- Zuka Properties WULA: Mun-Ya-Wana Conservancy *(Current)*

ECOLOGICAL ASSESSMENTS

- Ntunjambili Biodiversity Studies: Black Cubans Consulting *(Completed October 2018)*
- Middleburg Biodiversity Studies: Steve Tshwete Local Municipality *(Completed July 2018)*
- N3 New England Road Upgrade Faunal Study: KSEMS Environmental Consulting *(Completed October 2019)*
- Umlaas Gate Development Faunal Study: EcoPulse Consulting *(Completed January 2019)*
- Richards Bay Port Biodiversity Assessment: Transnet National Ports Authority *(Completed July 2018)*
- Underberg Dairy S24G Faunal Assessment: Underberg Dairy (Pty) Ltd *(Completed October 2019)*
- Babanango Faunal Species List: Nature Stamp *(Completed November 2019).*
- Gluckstaadt Water Supply Scheme Faunal Assessment: Zululand District Municipality c/o SiVEST Civil Engineering *(Current)*
- Shayamoya Housing Development Vegetation Assessment: Greater Kokstad Municipality *(Current)*

VISUAL ASSESSMENTS

- Pofadder Wind Energy Farm Visual Impact Assessment: Arcus Consulting Services SA *(Completed November 2018)*
- Rondekop Wind Energy Farm Visual Impact Assessment: G7 Energies *(Completed October 2018)*

OTHER APPLICATIONS/ASSESSMENTS

- Glen Arum Farm 24G Application: Glen Arum Farm (Pty) Ltd *(Current)*
- Phinda Nature Reserve Maintenance Management Plan: Mun-Ya-Wana Conservancy *(Current)*
- Bishopstowe Strategic Environmental Assessment: Msunduzi Municipality *(Completed September 2018)*
- DTP State of Environment Report: Dube TradePort Corporation *(Completed May 2018)*
- Maphumulo Weir Amendment: Umgeni Water *(Current)*

Other Experience

- Reconstruction of the Sand River Bridge, St Francis Bay: BVi Consulting Engineers.
- Driftsands Expansion of the Waste Water Treatment works: Bosch Holdings.
- Proposed Upgrade of the Grassridge – Sunnyside – Melkhout 132kV Powerline, Eastern Cape Province: ESKOM SOC Ltd.
- Construction of the Tombo – Mafini 132kV Powerline, Port St Johns: ESKOM SOC Ltd.
- GIS and data input of plant community data in the Drakensberg region of KwaZulu-Natal: South African Environmental Observation Network (SAEON)
- Groundtruthing of Roads and Assets in EKZN Wildlife protected areas: Ezemvelo KZN Wildlife

MM/YY 09/2020

CURRICULUM VITAE

Michelle Nevette

Name	Michelle Nevette
Profession	Environmentalist
Name of Firm	SiVEST SA (Pty) Ltd
Present Appointment	Divisional Manager: SiVEST Environmental Division
Years with Firm	21 Years
Date of Birth	18 March 1975
ID No.	7503180357085
Nationality	South African

Professional Qualifications

- BA (Economics), Honours in Environmental Management
- MEnvMgt. (Environmental Management) - University of South Africa
- ISO 14001:2015 Introduction and Implementation of an EMS (03/2018)
- Cert.Nat.Sci. reg. No. 120356 (July 2020)

Membership to Professional Societies

- South African Council for Natural Scientific Professions
- International Association for Impact Assessment South Africa (IAIAsa)
- Environmental Assessment Practitioners Association of South Africa (EAPSA) No.2019/1560

Employment Record

Aug 2009 – to date	SiVEST SA (Pty) Ltd Environmental Division: Divisional Manager
April. 1999 – Aug 2009	SiVEST Environmental Division: Senior Environmental Project Manager

Language Proficiency

LANGUAGE	SPEAK	READ	WRITE
English	Fluent	Fluent	Fluent
Afrikaans	Good	Good	Good

Years of Working Experience: 21 years

Countries of Working Experience

- South Africa
- Zimbabwe

Fields of Specialisation

- Environmental Project Management
- Environmental Impact Assessment
- Environmental Management and Auditing
- Environmental Planning including ISO14001:2015

MM/YY 09/2020

CURRICULUM VITAE

Michelle Nevette

Overview

Michelle's strong managerial skills have been extensively used in setting up and running projects and in establishing and monitoring documentation systems. Responsible for the management of a team of environmental impact assessment practitioners, including financial management of the division in conjunction with the Managing Director, and ongoing responsibilities on various environmental projects.

Michelle has a keen interest in strategic planning and has been responsible for undertaking Strategic Environmental Assessments and for preparing Integrated Environmental Management Programs and Environmental Management Frameworks for various municipalities and private developers. Extensive experience in following the Basic Assessment and Environmental Impact procedure, as well as in preparing Environmental Management Plans, consulting with authorities and conducting Audits.

Expertise gained in a variety of environmental issues relating to municipal planning, mixed use development, agro-industrial developments, business parks, petrol filling stations, the housing sector, and infrastructural projects.

Projects Experience (by Sector)

ENVIRONMENTAL PLANNING /STRATEGIC PROJECTS

- Appointed by the Cato Ridge Logistisc Hub Consortium (Pty) Ltd for the Cato Ridge Pilot Intermodal Project in Cato Ridge, KwaZulu-Natal (planning, BA/EIA and WULA).
- Appointed by Royal Shaka Estate (Pty) Ltd to project manage and obtain the necessary town planning and environmental rights the proposed 2155ha Royal Shaka Estate, North Coast.
- Port of Richards Bay – Strategic Environmental Assessment for Transnet National Ports Authority, (Aug 2018 – May 2019).
- Appointed by SMEC, on behalf of KZN COGTA, to undertake a High-level Environmental Status Quo & Recommendations Report for the Strategic Corridor Plan – Strategic Infrastructure Projects 2: Durban – Free State – Gauteng Development Region (June 2014 – present).
- Appointed by Finningley to assist with finalising the EIA and post authorisation work (including bulk servicing to the site on a mixed use development) which included provision for an Autobody Supply Park.
- Advised Toyota SA on the EIA requirement for a proposed site for a Toyota Autobody
- Preparation of a Strategic Environmental Assessment (SEA) for the Airports Company South Africa (ACSA) for a portion of property known as the Eastern Precinct.
- Appointed by ACSA to undertake an EIA for a portion of property known as the Eastern Precinct to house an automotive park.
- Appointed by Crookes Brothers Limited to prepare an EMF and subsequently an EIA for two properties comprising 1800ha in extent.
- Appointed by the KwaDukuza Municipality to undertake an SEA for KwaDukuza.
- Appointed by the uThungulu District Municipality to prepare an Integrated Environmental
- Management Plan (IEMP) for the District

Pre-feasibility Studies/Screening

- Appointed by Process Projects to undertaken an environmental screening of Site Selection for Lithium ION NMC Precursor Materials Production (IDC project).
- Edgewood New Teaching and Learning Building. University of KwaZulu Natal. Desktop Environmental Screening Assessment and Mapping.
- Izotsha Hub Development, Izotsha. LDM. Desktop Environmental Prefeasibility Assessment and Mapping.
- Cato Ridge Development Project. SMEC. Desktop Biophysical Prefeasibility Assessment.
- Hammarsdale Link Road Project. SMEC. Desktop Environmental Screening Assessment.
- Msinga Cwaka New Town Centre – Appointed by LDM Consulting to undertake an Environmental Pre-feasibility Study for the Cwaka New Town Centre in in Msinga Municipality, KwaZulu-Natal (Dec 2014).
- Avondale Forest Estate – Appointed by Trencon to undertake an Environmental Pre-feasibility
- Study for the Residential Eco-Estate adjacent Zimbali in Ballito, KwaZulu-Natal (Sep 2014).

CURRICULUM VITAE

Michelle Nevette

Climate Change

- Durban Climate Change Strategy – Appointed by eThekwini Municipality Environmental Planning and Climate Protection Department to establish a city status quo and recommendations to facilitate the implementation of climate change work within the city (May – Sep 2018).

Natural Resource Management (Environmental Rehabilitation)

- Renishaw Estate – Appointed by the Department of Environmental Affairs: Natural Resource Management Directorate to undertake the rehabilitation of the 1,833ha Mpambanyoni Conservation Development and Renishaw Estate (a mixed-use estate development with a strong conservation ethic) near Scottburgh, South Coast, KwaZulu-Natal (Dec 2017 – present).

POLICY & LEGISLATION

Review of Section 22 ECA Applications

- Appointed by DEAT to review and assess the pending Environmental Impact Assessment Applications for KZN submitted in terms of Section 22 of Environmental Conservation Act, Act 73 OF 1989.

Alien Vegetation

- Appointed to develop an auditing framework and to audit the eThekweni Municipality Production and Display Nurseries to determine their compliance with the Conservation of Agriculture Resources Act , 1983 (ACT No. 43 OF 1983) (CARA)

Coastal Zone Management

- Environmental Impact of the Alleged Illegal Cottages along the Wild Coast (former Transkei)

Telecommunication Policy for Urban Areas in KwaZulu-Natal

- Prepared on behalf of the Town and Regional Planning Commission. This policy involved extensive stakeholder consultation and included extensive research on the impact of telecommunication towers and associated infrastructure in urban areas. Assisted in the collection and preparation of data.

Training

- Appointed by uThungulu District Municipality to prepare training manuals and operational procedures manuals on EIA's which provided guidelines and principles for the District and Local Municipalities.

Advisory Services

- Appointed by Oxygen to provide environmental advisory services and assistance to municipal projects that have become 'stuck' on behalf of KZN PROV TREASURY for MUNICIPAL INFRASTRUCTURE

BUSINESS/INDUSTRY PROJECTS

- Audit of AMR to review their waste management practice and EMPr on behalf of Hillside Aluminium South 32
- ISO14001:2015 Internal Audit of Hillside Aluminium South 32
- ISO14001: 2015 Compilation of Legal Compliance Register and Aspects and Impacts Register for Technipaint (Pty) Ltd
- Appointed by Richards Bay Minerals (RBM) to conduct a performance assessment of RBM's approved EMPr and compile a legal liability report
- Permit/license external compliance audit for Bayside Aluminium
- Permit/license external compliance audit for Hillside Aluminium
- Permit/license external compliance audit for Metalloys Manganese Smelter in Meyerton

CURRICULUM VITAE

Michelle Nevette

Ports/Marine Infrastructure:

- Basic Assessment Report and EMP for the construction of marine infrastructure required for a floating dry dock in the Port of Richards Bay (Operation Phakisa)
- Preparation of a Sustainability Report and Environmental/Community Interface Report for new CO1 Conveyor for Transet Capital Project as FEL3 phase of Project Life Cycle process.

Petrol Filling Stations:

- Appointed by Engen Petroleum Limited to undertake BAs for the following Service Stations: Engen Ottowa, Engen Tongaat and Engen Galleira
- Appointed by Engen Petroleum Limited to undertake EIAs for the following Service Stations: Engen Umhlali; Engen Riverhorse 1; Engen Riverhorse 2; Engen CBD Downs and Engen Stapleton,;
- Appointed by Shell SA Marketing (PTY) Ltd to undertake EIAs for a petrol filling station, convenience stores and ATM at Mkuze, Phoenix and Hans Dettman.
- Appointed by Shell SA Marketing (Pty) Ltd to undertake the scoping process for a petrol filling station, convenience stores and ATM at Chatsworth, Marionhill, Verulam, Hannaford, Northcroft, Eastbury and Brookdale within Durban.
- Appointed by Shell SA Marketing (Pty) Ltd to undertake application for Exemptions for the upgrade of existing petrol filling stations at Bayhead and Gateway, Durban.
- Appointed by Caltex Oil South Africa (Pty) Ltd to prepare a Scoping Report and EMP for a petrol filling station, convenience stores and ATM at Brackenham, Richards Bay
- Preparation of Scoping Report and EMP for Philani Valley Petrol Station and Commercial Centre
- Preparation of Scoping Report and EMP for Umlazi Valley Petrol Station and Commercial Centre

Crude storage:

- Preparation for the Airports Company South Africa (ACSA) of an EIA for a proposed subdivision and rezoning of a portion of their property for future use by NATCOS (crude storage facility).

Mixed use/Business Park/Logistics/Shopping Centre:

- Appointed by the Cato Ridge Logistisc Hub Consortium (Pty) Ltd for the Cato Ridge Pilot Intermodal Project in Cato Ridge, KwaZulu-Natal (planning, BA/EIA and WULA).
- Preparation of an EIA for a mixed use development at Renishaw
- Appointed by Finningley to assist with finalising the EIA and post authorisation work (including bulks servicing to the site on a mixed use development) which included provision for an autosupply park.
- Advised Toyota SA on the EIA requirement for a proposed site for a Toyota Autobody
- Appointed by Barkomotive (Pty) Ltd, a wholly-owned subsidiary of Ellingham Estate (Pty) Ltd, to undertake an EIA Report for the proposed mixed-use Rorqual Estate Development near Park Rynie, South Coast, KwaZulu-Natal (October 2012).
- Appointed by the Passenger Rail Association of South Africa for the construction of an Intersite. Precinct in Scottburgh, located on the KwaZulu-Natal South Coast.
- Preparation of Duty of Care, Basic Assessment and EMP for Shoprite Distribution Center in Canelands.
- Preparation of a Basic Assessment for Sakhisizwe Holdings (Pty) Ltd for the proposed Warwick Mall as part of the 2010 World Cup Initiatives.
- Preparation of a Basic Assessment Prime Spot Trading 9 (Pty) Limited for the proposed Sithole Mall Shopping Centre in Osizweni
- Basic Assessment Report for a warehouse in Alton, Richards Bay, Briardale Trading
- Basic Assessment Report and EMP for a convenience centre in Gingindlovu
- Basic Assessment Report for the Amangwane Shopping Centre in Ulundi
- Preparation of an EIA for the Airports Company South Africa (ACSA) for a proposed Business Park on a portion of property known as the Eastern Precinct to house an automotive park.
- Preparation of an application for exemption for the Airports Company South Africa (ACSA) to lease a portion of their property to Shoprite-Checkers

CURRICULUM VITAE

Michelle Nevette

Waste License Applications

- Appointed by Richards Bay Minerals to undertake the waste license application for the salvage yard and ZN4.
- Appointed by Richards Bay Coal Terminal to undertake the waste license application for their existing operations.

COMMUNITY UPLIFTMENT PROJECTS

- Appointed by Renishaw Property Development (Pty) Ltd for the construction of a school containing sporting facilities, parking areas and engineering services in Scottburgh.
- Appointed by Industrial Development Corporation (IDC) to undertake an EIA Report for the proposed Nonoti Beach Tourism Development near Blythedale, North Coast, KwaZulu-Nata
- Basic Assessment Report and EMP for the uMhlathuze Multi-Purpose Sport Stadium in Richards Bay, uThungulu District Municipality
- Appointed by the Department of Works to prepare a Scoping Report and EMP for the rezoning of an "open space" area in Port Shepstone to "public administration"
- Appointed by the Department of Works to prepare an Application for Exemption for a police station and community hall in Khenani, Richards Bay.

RESIDENTIAL PROJECTS

Low Cost Housing

- Greater Amaoti Housing Project – Appointed by the Department of Human Settlements to undertake the EIA process for the development of 20 000 housing units in Amaoti. eThekwini Municipality.
- Shayamoya Phase 3 Housing Development – Appointed by the Greater Kokstad Local Municipality to undertake the EIA process for the housing development.
- Appointed by Oxygen Infrastructure Solutions for development of the Marianridge Housing Development in Marianridge, KwaZulu-Natal.
- Appointed by eThekwini to undertake an EIA for Madimeni, Lower Langefontein and Molweni Low Cost Housing.
- Appointed by eThekwini to undertake an EIA for Trenance Park 2B and Redcliffe Low Cost Housing
- Appointed by eThekwini to undertake a Basic Assessment for Philani Valley Phase 17-25 Low Cost Housing
- Appointed by the Ethekwini Housing Department to prepare Environmental Scoping Reports, EMPs and to undertake auditing for the following low cost housing projects:
  - Africa, Inanda
  - Stop 8/Nambia, Emtshabeni
  - Kwamashu Newland
  - Mshayazafe
  - Kwadabeka C
  - Verulam: Trenace Park 2B and Redcliffe
  - Lamontville North West
- Appointed to undertake an Environmental Considerations report for Vulemehlo Low cost Housing

Medium – High Income Housing:

- Appointed by Canboria Developments to prepare a Scoping Report for the proposed medium income housing project at Broadlands.
- Appointed by Midnight Storm Investors to prepare an Environmental Considerations Report for the development of a new multi-storey residential development on Lots 739 – 744, Tongaat.
- Appointed by Midnight Storm Investors to prepare an EMP and undertake auditing for Simbhiti Eco-Estate

CURRICULUM VITAE

Michelle Nevette

LINEAR DEVELOPMENT / INFRASTRUCTURE PROJECTS

- Project management and preparation of a range of Environmental Applications for the uMhlathuze Municipality Engineering Department for the financial year 2003/2004: This included environmental applications and auditing for road, water, canal, subdivisions and informal trading facilities projects.

Water Supply Schemes:

- Northern Aqueduct Augmentation Pipeline: Appointed by Aurecon Consulting Engineers for the construction of a pipeline from Ntuzuma to Ogunjini.
- Appointed by VGC to provide environmental services (environmental application, EMP and auditing) for a range of water supply projects, e.g. Mhlana, Madlebe, Khoza Water Supply Projects.
- Witz Road Water Reticulation for Ethekwini Municipality – Basic Assessment and monthly auditing for a 6500m of 160mm diameter pipeline.
- Appointed by uThungulu to undertake a scoping process for Middledrift water supply
- Mtamvuna River Irrigation Potential Investigation, Izingolweni Sub-region, KwaZulu-Natal.

Roads and Bridges:

- Integrated Rapid Public Transport Network (IRPTN) – Appointed by the Ethekwini Transport Authority, responsible for the planning, implementation and operations of public transport in the City, to undertake an EIA report for the IRPTN Corridor 1, Bridge City to Durban CBD, and Corridor 9, Bridge City to Umhlanga
- Integrated Rapid Public Transport Network (IRPTN) – Appointed by the Ethekwini Transport Authority, responsible for the planning, implementation and operations of public transport in the City, to undertake a BA report for the IRPTN Corridor 3, Bridge City to Pinetown.
- Appointed by eThekwini to undertake a Basic Assessment for the proposed Warwick Flyover (inbound and outbound) in Warwick Precinct as part of the 2010 World Cup Initiative.
- Appointed by eThekwini to undertake a Basic Assessment for the proposed Inwabi Road I Umlazi.
- Appointed by Umhlathuze Municipality to undertake an application for Exemption for the upgrade of a 1,5km gravel road (including a proper river crossing) within the existing alignment of the road in Ngwelezane.
- Appointed to undertake an application for Exemption for the Greytown Road Upgrade, KwaZulu-Natal
- Appointed to undertake a scoping process (including EMP) for the upgrading of Broadway, Durban North on behalf of the eThekweni Municipality Appointed to undertake an application for Exemption, EMP and auditing for the upgrading of theWick/Todd Street in Verulam

Electricity/ Power lines

- Appointed by appointed by TRANS-AFRICA PROJECTS to manage the environmental process for the proposed Spoornet Coalink Upgrade Project. The project consists of the upgrade of existing infrastructure and three new transmission sub-stations, in order to increase the supply of electricity for new locomotives that Spoornet have ordered to add to the export capacity of coal. The proposed project crosses provincial borders starting in Empangeni (Natal) and extends across Newcastle to Ermelo (Mpumalanga)
- Appointed by uMhlathuze Municipality to undertake an EIA for the proposed Cygnus Electricity Substation project.
- Appointed by Eskom to undertake the scoping process (including the preparation of an EMP) for a substation and associated powerlines in Mtunzini
- Electricity Supply through Mhlanga Forest Estate Development EMP, KwaZulu-Natal, South Africa

Pipelines

- Sezela Marine Outfall Pipeline, Scoping Report & Environmental Management Plan, KZN
- Petronet Re-Routing of existing DJP Pipeline around Pietermaritzburg EIA Scoping Report & Environmental Management Plan, KwaZulu-Natal

CURRICULUM VITAE

Michelle Nevette

WATER USE LICENSES

- Cato Ridge Pilot Intermodal Project in Cato Ridge (Zone 1), KwaZulu-Natal. Appointed by the Cato Ridge Logistics Hub Consortium (Pty) Ltd. Compilation and Submission of Water Use License.
- Malandela Crossroads Water Use License. Ethekwini Municipality. Compilation and Submission of Water Use license.
- Bridge City Depot Water Use License. Ethekwini Municipality. Compilation and Submission of
- Water Use license.
- Zamani 1B Phase B1 and B2 Water use License. Ethekwini Municipality. Compilation and Submission of Water Use license.

AMENDMENT APPLICATIONS

- Malandela Crossroads Development – Appointed by eThekwini Municipality to amend the Environmental Authorisation to include an amended layout.
- Northern Aqueduct Augmentation Pipeline – Appointed by Aurecon Consulting Engineers to amend the Environmental Authorisation for changes in the pipeline alignment from Ntuzuma to Ogunjini.
- Bridge City Depot – Appointed by the eThekwini Municipality to amend the Environmental Authorisation to extend the footprint of the development and apply for construction within wetland buffers.
- Zamani Low Cost Housing Development – Appointed by the eThekwini Municipality Housing Department to amend/extend the validity of the Environmental Authorisation
- Malandela Crossroads Development – Appointed by eThekwini Municipality to amend the Environmental Authorisation to exclude certain parties from a condition of the EA.
- Integrated Rapid Public Transport Network (IRPTN) C3B – Appointed by eThekwini Transport Authority to amend the Environmental Authorisation to include a deviation in the transport route as well as to add an additional depot site to the authorisation.

Courses Attended

- 2018: ISO 14001:2015 Introduction and Implementation of an EMS
- 2018: Risk ZA
- 2017: Amendments to the EIA Regulations
- 2017: NEC 3 Course

CURRICULUM VITAE

Name	Stephan Hendrik Jacobs
Profession	Environmentalist
Name of Firm	SiVEST SA (Pty) Ltd
Present Appointment	Environmental Consultant
Years with Firm	5 years
Date of Birth	28 May 1991, Pretoria, South Africa
ID Number	910528 5065 080
Nationality	South African

Education

- Pretoria Boys High, Pretoria, South Africa, Matriculated 2009.

Professional Qualification

- B.Sc. Hons Environmental Management and Analysis, (Post Graduate) University of Pretoria Honours (2014).
- B.Sc. Environmental Sciences (Undergraduate) University Of Pretoria (2012-2013)

Employment Record

Jan 2019 – Current	SiVEST SA (Pty) Ltd - Environmental Consultant
Aug 2018 – Dec 2018	Marang Environmental and Associates (Pty) Ltd – Environmental Consultant
May 2015 – Aug 2018	SiVEST SA (Pty) Ltd – Graduate Environmental Consultant
Nov 2014 – Feb 2015	Sodwana Bay Fishing Charters – Assistant Manager
Oct 2014 – Mar 2015	Ufudu Turtle Tours – Tour Guide

Language Proficiency

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

Years of Working Experience: 5 Years

Countries of Working Experience

- South Africa

Fields of Specialisation

- Environmental Management

Overview

Stephan originally joined SiVEST in May 2015 and held the position of Graduate Environmental Consultant in the Johannesburg office. After leaving SiVEST in August 2018, and being employed for a brief period at another environmental consulting company, Stephan re-joined SiVEST in January 2019 and currently holds the position of Environmental Consultant in the Gauteng region (Pretoria and Johannesburg).

Stephan has been extensively involved in Environmental Impact Assessment (EIA) and Basic Assessment (BA) processes for various types of projects / developments, in particular renewable energy projects / developments which form part of South Africa's Renewable Energy Independent Power Producer Procurement Programme (REIPPPP). As such, Stephan has vast experience with regards to the compilation of Environmental Impact Assessments (EIAs) and Basic Assessments (BAs). Additionally, Stephan has extensive experience in undertaking public participation and stakeholder engagement processes. Stephan has also assisted extensively in the undertaking of field work and the compilation of reports for specialist studies such as Surface Water and Visual Impact Assessments. Stephan also has considerable experience in Environmental Compliance and Auditing and has acted as an Environmental Control Officer (ECO) for several infrastructure projects.

Skills:

- Strong computer skills (Work, excel, PowerPoint etc.);
- Strong Proposal and report writing skills;
- Report compilation skills for Environmental Impact Assessments (EIAs) and Basic Assessments (BAs);
- Report compilation skills for Environmental Management Plans/Programmes (EMPr);
- Compilation and conducting Visual Impact Assessments;
- Assisting in Surface Water / Wetland Delineations and Assessments.

Key experience:

- Environmental Impact Assessment (EIA) of small, medium and large-scale infrastructure projects,
- Basic Assessment (BA), of small, medium and large-scale infrastructure projects,
- Environmental Management Plans (EMPr), of small, medium and large-scale infrastructure projects,
- Undertaking of Public Participation and Stakeholder Engagement Processes
- Proposal and tender compilation,
- Environmental Compliance and Auditing (ECO);
- Various site inspections, and
- Visual Impact Assessments (Field work and report compilation).

Projects Experience (by Sector)

Stephan is responsible for the following activities: report writing, proposal writing, assisting in specialist surface water delineation and functional assessments, assisting in visual impact assessments and environmental compliance and auditing procedures. Current and completed projects / activities, along with a description of the role played in each project / activity, are outlined in detail below:

ENVIRONMENTAL CONTROL OFFICER (ECO) MONITORING / AUDITING PROJECTS: -

- Environmental Control Officer (ECO) for the Polokwane Integrated Rapid Public Transport System (IRPTS), Limpopo Province.

- Environmental Control Officer (ECO) for Phase 1 and Phase 2 of the Newmarket Retail Development, Gauteng Province.

- Environmental Control Officer (ECO) for the proposed NuPay Office Block development at the Newmarket Retail Development, Gauteng Province.

- Environmental Control Officer (ECO) for the proposed Construction of the Decathlon Building at the Newmarket Retail Development, Gauteng Province.

- Environmental Control Officer (ECO) for the External Road Upgrades at the Newmarket Retail Development, Gauteng Province.

- Environmental Control Officer (ECO) for the Netcare Alberton Hospital Development as part of the Greater Newmarket Development, Gauteng Province.

BASIC ASSESSMENTS (BAS) FOR INFRASTRUCTURE PROJECTS:

- Basic Assessment (BA) for the construction of a Non-Motorised Transport (NMT) Training and Recreational Park adjacent to the Peter Mokaba Stadium in Polokwane, Limpopo Province.
- Basic Assessment (BA) for the Proposed Expansion of the Tissue Manufacturing Capacity at the Twinsaver Kliprivier Operations Base, Gauteng Province.
- Basic Assessment (BA) for the Proposed Construction of a New SPAR Distribution Centre on Erf 1092 at Redhouse in Port Elizabeth, Eastern Cape Province.

BASIC ASSESSMENTS (BAs) FOR RENEWABLE ENERGY PROJECTS:

- Basic Assessment (BA) for the Proposed Construction of the Graskoppies Substation, Linking Substation and Associated 132kV Power Line near Loeriesfontein, Northern Cape Province.
- Basic Assessment (BA) for the Proposed Construction of the Hartebeest Leegte Substation, Linking Substation and Associated 132kV Power Line near Loeriesfontein, Northern Cape Province.
- Basic Assessment (BA) for the Proposed Construction of the Ithemba Substation, Linking Substation and Associated 132kV Power Line near Loeriesfontein, Northern Cape Province.
- Basic Assessment (BA) for the Proposed Construction of the !Xha Boom Substation, Linking Substation and Associated 132kV Power Line near Loeriesfontein, Northern Cape Province.
- Basic Assessment (BA) for the Proposed Development of the Tooverberg Wind Energy Facility (WEF) near Touws River, Western Cape Province.
- Basic Assessment (BA) for the Proposed Development of the Tooverberg On-site Eskom Substation and 132kV Power Line for the proposed Tooverberg Wind Energy Facility (WEF) near Touws River, Western Cape Province.

ENVIRONMENTAL IMPACT ASSESSMENTS (EIAs) FOR RENEWABLE ENERGY PROJECTS: -

- Environmental Impact Assessment (EIA) for the Proposed Construction of the Graskoppies Wind Farm near Loeriefontein, Northern Cape Province.
- Environmental Impact Assessment (EIA) for the Proposed Construction of the Hartebeest Leegte Wind Farm near Loeriefontein, Northern Cape Province.
- Environmental Impact Assessment (EIA) for the Proposed Construction of the Ithemba Wind Farm near Loeriefontein, Northern Cape Province.
- Environmental Impact Assessment (EIA) for the Proposed Construction of the !Xha Boom Wind Farm near Loeriefontein, Northern Cape Province.
- Environmental Impact Assessment (EIA) for the Proposed Construction of the 325MW Rondekop Wind Energy Facility between Matjiesfontein and Sutherland, Northern Cape Province.
- Environmental Impact Assessment (EIA) for the Proposed Construction of the Mooi Plaats Solar Photovoltaic (PV) Energy Facility near Noupoort, Northern Cape Province.

- Environmental Impact Assessment (EIA) for the Proposed Construction of the Wonderheuvel Solar Photovoltaic (PV) Energy Facility near Noupoort, Northern Cape Province.

- Environmental Impact Assessment (EIA) for the Proposed Construction of the Paarde Valley Solar Photovoltaic (PV) Energy Facility near Middelburg, Eastern Cape Province.

PART 2 ENVIRONMENTAL AUTHORISATION (EA) AMENDMENT PROCESSES FOR RENEWABLE ENERGY PROJECTS:

- Part 2 Environmental Authorisation (EA) Amendment Process for the Proposed Development of the Aletta 140MW Wind Energy Facility (WEF) and Associated Infrastructure near Copperton, Northern Cape Province.

- Part 2 Environmental Authorisation (EA) Amendment Process for the Proposed Development of the 140 MW Beaufort West Wind Farm in the Prince Albert Local Municipality, Western Cape Province.

- Part 2 Environmental Authorisation (EA) Amendment Process for the Proposed Development of the 140MW Trakas West Wind Farm in the Prince Albert Local Municipality, Western Cape Province.

- Part 2 Environmental Authorisation (EA) Amendment Process for the Proposed Construction of the Dwarsrug Wind Farm near Loeriesfontein, Northern Cape Province.

- Part 2 Environmental Authorisation (EA) Amendment Process for the Proposed Construction of the 235MW Graskoppies Wind Farm near Loeriefontein, Northern Cape Province.

- Part 2 Environmental Authorisation (EA) Amendment Process for the Proposed Construction of the 235MW Hartebeest Leegte Wind Farm near Loeriefontein, Northern Cape Province.

- Part 2 Environmental Authorisation (EA) Amendment Process for the Proposed Construction of the 235MW Ithemba Wind Farm near Loeriefontein, Northern Cape Province.

- Part 2 Environmental Authorisation (EA) Amendment Process for the Proposed Construction of the 235MW !Xha Boom Wind Farm near Loeriefontein, Northern Cape Province.

VISUAL IMPACT ASSESSMENTS (VIAs) FOR INFRASTRUCTURE PROJECTS

- Visual Impact Assessment for the Nsoko Msele Integrated Sugar Project, Swaziland.

- Visual Impact Assessment for the Proposed Tinley Manor South Banks Beach Enhancement Solution, KwaZulu-Natal Province.

- Visual Impact Assessment for the Proposed Tinley Manor South Banks Beach Enhancement Solution, KwaZulu-Natal Province.

- Visual Impact Assessment for the proposed Mlonzi Hotel and Golf Estate Development, Near Lusikisiki, Eastern Cape Province

- Visual Impact Assessment for the Proposed Assagay Valley Development, KwaZulu-Natal Province.

- Visual Impact Assessment for the Proposed Kassier Road North Development, KwaZulu-Natal Province.

VISUAL IMPACT ASSESSMENTS (VIAs) FOR RENEWABLE ENERGY PROJECTS: -

- Visual Impact Assessment for the Helena Solar PV Plant, Northern Cape Province.
- Visual Impact Assessments for the proposed construction of the Sendawo Solar 1, Sendawo Solar 2 and Sendawo Solar 3 Photovoltaic (PV) Energy Facilities near Vryburg, North West Province.
- Visual Impact Assessments for the proposed construction of the Sendawo Substation and Associated 400kV Power Line near Vryburg, North West Province.
- Visual Impact Assessments for the proposed construction of the Tlisitseng Solar 1 and Tlisitseng Solar 2 Photovoltaic (PV) Energy Facilities near Lichtenburg, North West Province.
- Visual Impact Assessment for the proposed construction of the Tlisitseng 1 132kV Substation and associated 132kV Power Line near Lichtenburg, North West Province.
- Visual Impact Assessment for the proposed construction of the Tlisitseng 2 132kV Substation and associated 132kV Power Line near Lichtenburg, North West Province.
- Visual Impact Assessment for the proposed construction of the 3000MW PhilCo Green Energy Wind Farm and Associated Infrastructure near Richmond, Northern Cape Province.
- Visual Impact Assessment for the proposed construction of the Aletta 140MW Wind Energy Facility neat Copperton, Northern Cape Province.
-
- Visual Impact Assessment for the proposed construction of the Aletta 132kV Substation and associated 132kV Power Line near Copperton, Northern Cape Province.
- Visual Impact Assessment for the proposed construction of the Eureka 140MW Wind Energy Facility and associated Infrastructure near Copperton, Northern Cape Province.
- Visual Impact Assessment for the proposed construction of the Eureka 400kV Substation and 400kV Power Line neat Copperton, Northern Cape Province.
- Visual Impact Assessment for the Proposed Construction of the Graskoppies Wind Farm near Loeriesfontein, Northern Cape Province.
- Basic Visual Impact Assessment for the Proposed Construction of the Graskoppies Substation, Linking Substation and Associated 132kV Power Line near Loeriesfontein, Northern Cape Province.
- Visual Impact Assessment for the Proposed Construction of the Hartebeest Leegte Wind Farm near Loeriesfontein, Northern Cape Province.
- Basic Visual Impact Assessment for the Proposed Construction of the Hartebeest Leegte Substation, Linking Substation and Associated 132kV Power Line near Loeriesfontein, Northern Cape Province.
- Visual Impact Assessment for the Proposed Construction of the Ithemba Wind Farm near Loeriesfontein, Northern Cape Province.
- Basic Visual Impact Assessment for the Proposed Construction of the Ithemba Substation, Linking Substation and Associated 132kV Power Line near Loeriesfontein, Northern Cape Province.
- Visual Impact Assessment for the Proposed Construction of the !Xha Boom Wind Farm near Loeriesfontein, Northern Cape Province.

- Basic Visual Impact Assessment for the Proposed Construction of the !Xha Boom Substation, Linking Substation and Associated 132kV Power Line near Loeriesfontein, Northern Cape Province.

- Visual Impact Assessment for the Proposed Construction of the 315MW Phezukomoya Wind Energy Facility near Noupoort, Northern Cape Province.

- Visual Impact Assessment for the Proposed Construction of the 390MW Sankraal Wind Energy Facility near Noupoort, Northern Cape Province.

- Visual Impact Assessment for the proposed development of the Phase 1 Kuruman Wind Energy Facility, Kuruman, Northern Cape Province.

- Visual Impact Assessment for the proposed development of the Phase 2 Kuruman Wind Energy Facility, Kuruman, Northern Cape Province.

- Basic Visual Impact Assessment for the proposed development of Supporting Electrical Infrastructure to the Phase 1 and Phase 2 Kuruman Wind Energy Facilities, Kuruman, Northern Cape Province.

- Visual Impact Assessment for the proposed development of the 325MW Kudusberg Wind Energy Facility (WEF) located between Matjiesfontein and Sutherland in the Northern and Western Cape Provinces.

- Basic Visual Impact Assessment for the proposed construction of up to a 132kV Power Line and Associated Infrastructure for the Rooipunt Solar Thermal Power Plant near Upington, Northern Cape Province.

- Basic Visual Impact Assessment for the proposed construction of up to a 132kV Power Line and Associated Infrastructure for the proposed Kalkaar Solar Thermal Power Plant near Kimberly, Free State and Northern Cape Provinces.

ENVIRONMENTAL SCREENING / ENVIRONMENTAL REVIEW / ENVIRONMENTAL DUE DILIGENCE PROJECTS

- Environmental Review of the Xakwa Coal Operations, adjacent to the proposed Eastside Junction Development.

- Environmental Due Diligence for the Woodlands and Harrowdene Office Parks in Woodmead, Gauteng Province.

SURFACE WATER ASSESSMENTS FOR INFRASTRUCTURE PROJECTS

- Surface Water Assessment for the Steve Thswete Local Municipality, Mpumalanga Province.

- Surface Water Delineation and Assessment for the proposed coal Railway Siding at the Welgedacht Marshalling Yard and associated Milner Road Upgrade near Springs, Ekurhuleni Metropolitan Municipality.

ANNEXURE B
ENVIRONMENTAL INCIDENTS

LOG Environmental Incident Log

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

ANNEXURE C
COMPLAINTS RECORD SHEET

Complaints Record Sheet

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

ANNEXURE D
MANAGEMENT OF SOILS - GUIDELINES

Topsoil

- Topsoil must be stripped from all areas that are to be utilised during the construction period and where permanent structures and access is required. These areas will include temporary and permanent access roads, construction camps, and lay down areas. Topsoil must be stripped after clearing of woody vegetation and before excavation or construction commences.
- The topsoil is regarded as the top 300mm of the soil profile irrespective of the fertility appearance, structure, agricultural potential, fertility and composition of the soil.

Topsoil stripping

- Soil must be stripped to a minimum depth of 150mm and maximum depth of 300mm or to the depth of bedrock where soil is shallower than 300mm. Herbaceous vegetation, overlying grass and other fine organic matter must not be removed from the stripped soil.
- No topsoil which has been stripped must be buried or in any other way be rendered unsuitable for further use by mixing with spoil or by compaction using machinery.
- Topsoil must preferably be stripped when it is in a dry condition in order to prevent compaction.

Topsoil stockpiling

- The Consulting Engineer or Environmental Control Officer must stockpile stripped topsoil in areas, which have been approved. Soil stockpiles must take the form of windows.
- To prevent erosion, material stockpiled for long periods (2 weeks) must be retained in a bermed area.
- Topsoil, mulch and subsoil stockpiles must be placed in higher-lying areas of the sit, and must not be positioned within stormwater channels or areas of ponding.
- Topsoil stripped from different soil zones must be stockpiled separately and clearly identified as such. Under no circumstances must topsoil obtained from different soil zones be mixed.
- Soil stockpiles must not be higher than 2m or stored for a period longer than one year. The slopes of soil stockpiles must not be steeper than 1 vertical to 2.5 horizontal.
- No vehicles must be allowed access onto the stockpiles after they have been placed. Topsoil stockpiles must be clearly demarcated in order to prevent vehicle access and for later identification when required.
- Soil stockpiles must not become contaminated with oil, diesel, petrol, garbage or any other material, which may inhibit the later growth of vegetation in the soil.
- After topsoil removal has been completed, the Contractor must apply soil conservation measures to the stockpiles where and as directed by the Consulting Engineer or Environmental Control Officer. This must include the use of erosion control fabric or grass seeding.

Topsoil replacement

- Topsoil must be replaced to a minimum depth of 75mm over all areas where it has been stripped and over disused borrow pits, after construction in those areas has ceased. Topsoil placement must follow as soon as construction in an area has ceased.
- All areas onto which topsoil is to be spread must be graded to the approximate original landform with maximum slopes of 1:25 and must be ripped prior to topsoil placement. The entire area must be ripped parallel to the contours to a minimum depth of 300mm.

- Topsoil must be placed in the same soil zone from which it had been stripped. However, if there is insufficient topsoil available from a particular soil zone to produce the minimum specified depth, topsoil must be brought from other soil zones at the approval of the Consulting Engineer or Environmental Control Officer.
- Where topsoil that has been stripped by the Contractor is insufficient to provide the minimum specified depth, the Contractor must obtain suitable substitute material from other sources at no cost to the employer. The suitability of the substitute material must be determined by means of soil analyses, which are acceptable to the Consulting Engineer or Environmental Control Officer.
- No vehicles must be allowed access onto or through topsoil after it has been reinstated.
- After topsoil reinstatement is complete, cleared and stockpiled vegetative matter must be spread randomly by hand over the top soiled area. The vegetative material must be replaced on the areas from where it has been removed.

ANNEXURE E
HERITAGE MANAGEMENT GUIDELINES AND PLAN

GENERAL MANAGEMENT GUIDELINES

1. In the event that an area previously not included in an archaeological or cultural resources survey is to be disturbed, the NWPHRA needs to be contacted. An enquiry must be lodged with them into the necessity for a Heritage Impact Assessment.
2. In the event that a further heritage assessment is required it is advisable to utilise a qualified heritage practitioner, preferably registered with the Cultural Resources Management Section (CRM) of the Association of Southern African Professional Archaeologists (ASAPA).
    a) This survey and evaluation must include:
    b) The identification and mapping of all heritage resources in the area affected;
    c) An assessment of the significance of such resources in terms of the heritage assessment criteria set out in section 6 (2) or prescribed under section 7 of the National Heritage Resources Act;
    d) An assessment of the impact of the development on such heritage resources;
    e) An evaluation of the impact of the development on heritage resources relative to the sustainable social and economic benefits to be derived from the development;
    f) The results of consultation with communities affected by the proposed development and other interested parties regarding the impact of the development on heritage resources;
    g) If heritage resources will be adversely affected by the proposed development, the consideration of alternatives; and
    h) Plans for mitigation of any adverse effects during and after the completion of the proposed development.
3. It is advisable that an information section on cultural resources be included in the SHEQ training given to contractors involved in surface earthmoving activities. These sections must include basic information on:
    a) Heritage;
    b) Graves;
    c) Archaeological finds; and
    d) Historical Structures.
4. This module must be tailor made to include all possible finds that could be expected in that area of construction. Possible finds include:
    a) Open air Stone Age scatters, disturbed during vegetation clearing. This will include stone tools.
    b) Palaeontological deposits such as bone, and teeth in fluvial riverbank deposits.
5. In the event that a possible find is discovered during construction, all activities must be halted in the area of the discovery and a qualified archaeologist contacted.
6. The archaeologist needs to evaluate the finds on site and make recommendations towards possible mitigation measures.
7. If mitigation is necessary, an application for a rescue permit must be lodged with NWPHRA.
8. After mitigation, an application must be lodged with NWPHRA for a destruction permit. This application must be supported by the mitigation report generated during the rescue excavation. Only after the permit is issued may such a site be destroyed.
9. If during the initial survey sites of cultural significance are discovered, it will be necessary to develop a management plan for the preservation, documentation or destruction of such a site. Such a program

must include an archaeological/palaeontological monitoring programme, timeframe and agreed upon schedule of actions between the company and the archaeologist.

10. In the event that human remains are uncovered, or previously unknown graves are discovered, a qualified archaeologist needs to be contacted and an evaluation of the finds made.
11. If the remains are to be exhumed and relocated, the relocation procedures as accepted by the South African Heritage Resources Agency (SAHRA) need to be followed. This includes an extensive social consultation process. Note: Grave relocation must only be considered as last resort. A detailed relocation process must be followed and it is recommended that an experienced consultant be appointed to manage the relocation process.

ANNEXURE F
STORM WATER MANAGEMENT PLAN

UPGRADE ENERGY (PTY) LTD

Leeuwbosch PV1 SWMP

Stormwater Management Plan

Issue Date: 22 March 2021
Revision No: 0
Project No: 15962
Document No: 15962-LEEUBOSCH_PV1-SWMP-VM-REV0.DOCX

Date:	22 March 2021
Document Title:	15962 – Leeuwbosch PV1 SWMP
Revision Number	0
Author	Vaseelan Moodley
Checked By:	Simon Joubert
Approved By:	Simon Joubert
Signature:	
Client:	Upgrade Energy (Pty) Ltd

Confidentiality Statement

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDICES

UPGRADE ENERGY (PTY) LTD

LEEUWBOSCH PV1 SWMP

1. INTRODUCTION & BACKGROUND

Upgrade Energy (Pty) Ltd propose to construct four 5MW Photovoltaic (PV) facilities and associated infrastructure on Farm Wildebeestkuil 59 and Farm Leeuwbosch 44, approximately 6-8km east of Leeudoringstad in the North West Province. The proposed sites are located within the Maquassi Hills Local Municipality which falls within the Dr Kenneth Kaunda District Municipality.

SiVEST SA (Pty) Ltd (SiVEST) were appointed to undertake the Basic Assessment Process which requires various specialist studies. SiVEST's Civil Engineering Division was appointed as the specialist consultant to develop a conceptual stormwater management plan (SWMP) for each of the proposed sites.

This SWMP focuses on the Leeuwbosch PV1 site which is located on Farm Leeuwbosch 44 (Portion 37). This report serves to provide a broad guideline for the developers, owners and professional teams to manage the stormwater and comply with the necessary rules and regulations of the relevant authorities and should not be viewed as a detailed design report.

The locality of the project and the PV site is shown in Figure 3-1 and Figure 3-2.

2. OBJECTIVES & SCOPE OF WORK

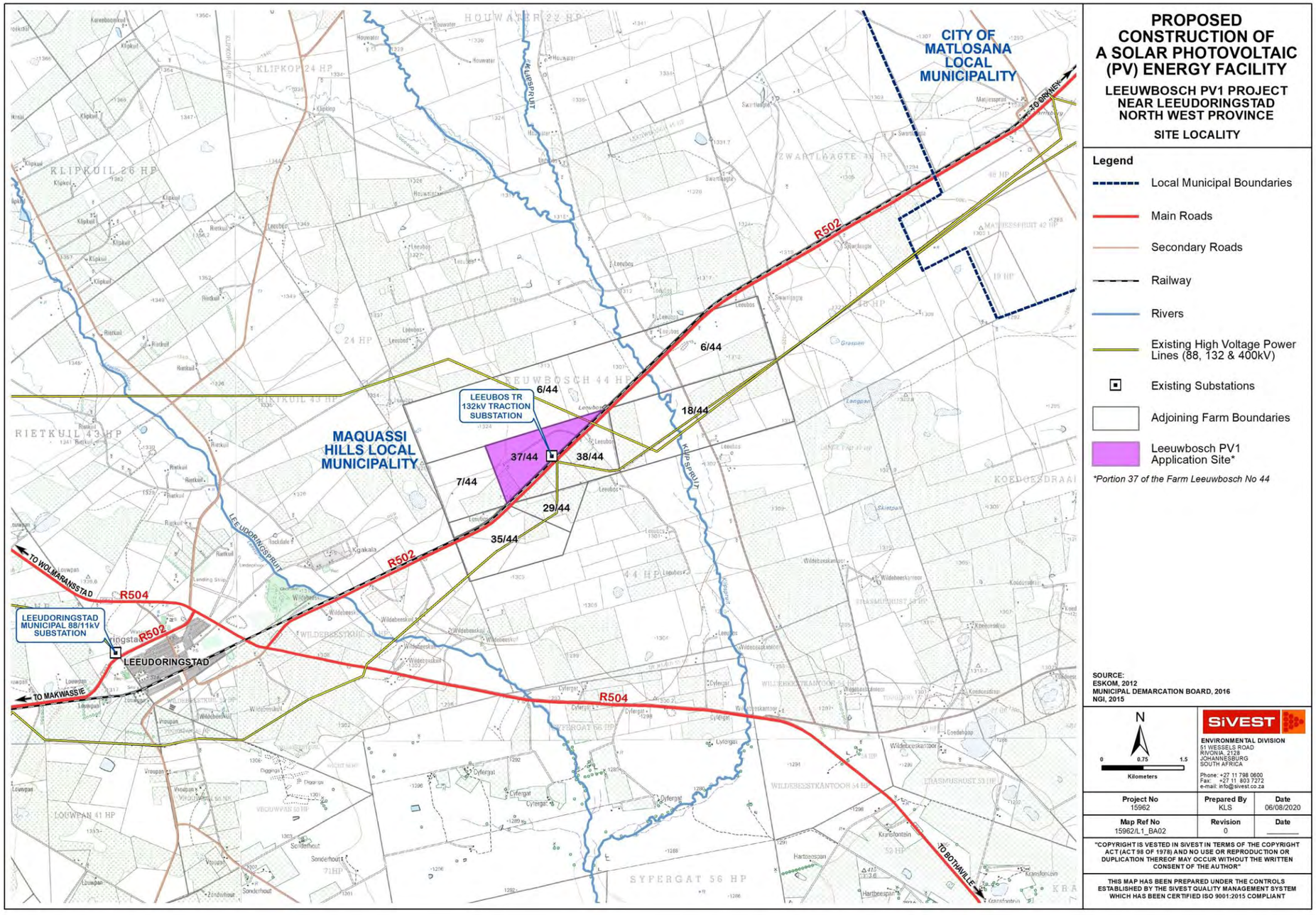
The main objective of the study is to develop a conceptual stormwater management plan for Site PV1. The scope of works comprises the following:

- Data collection;
- Liaison with the client;
- Site inspection to confirm topographical conditions;
- Hydrological assessment of the site;
- Development of conceptual drawings and design guidelines; and Compilation of the SWMP in the form of report.

3. DATA COLLECTION

The following data was collected and used to undertake this study:

- 5m contour data from Planet GIS;
- Proposed development footprint from SiVEST Environmental;
- Climate information from South African Weather Services;
- Design Rainfall data (JC Smithers & RE Schulze);
- Aerial Imagery from Google Earth and ESRI online base maps.



PROPOSED CONSTRUCTION OF A SOLAR PHOTOVOLTAIC (PV) ENERGY FACILITY
LEEUWBOSCH PV1 PROJECT NEAR LEEUDORINGSTAD NORTH WEST PROVINCE
SITE LOCALITY

Figure 3-1: Site Locality

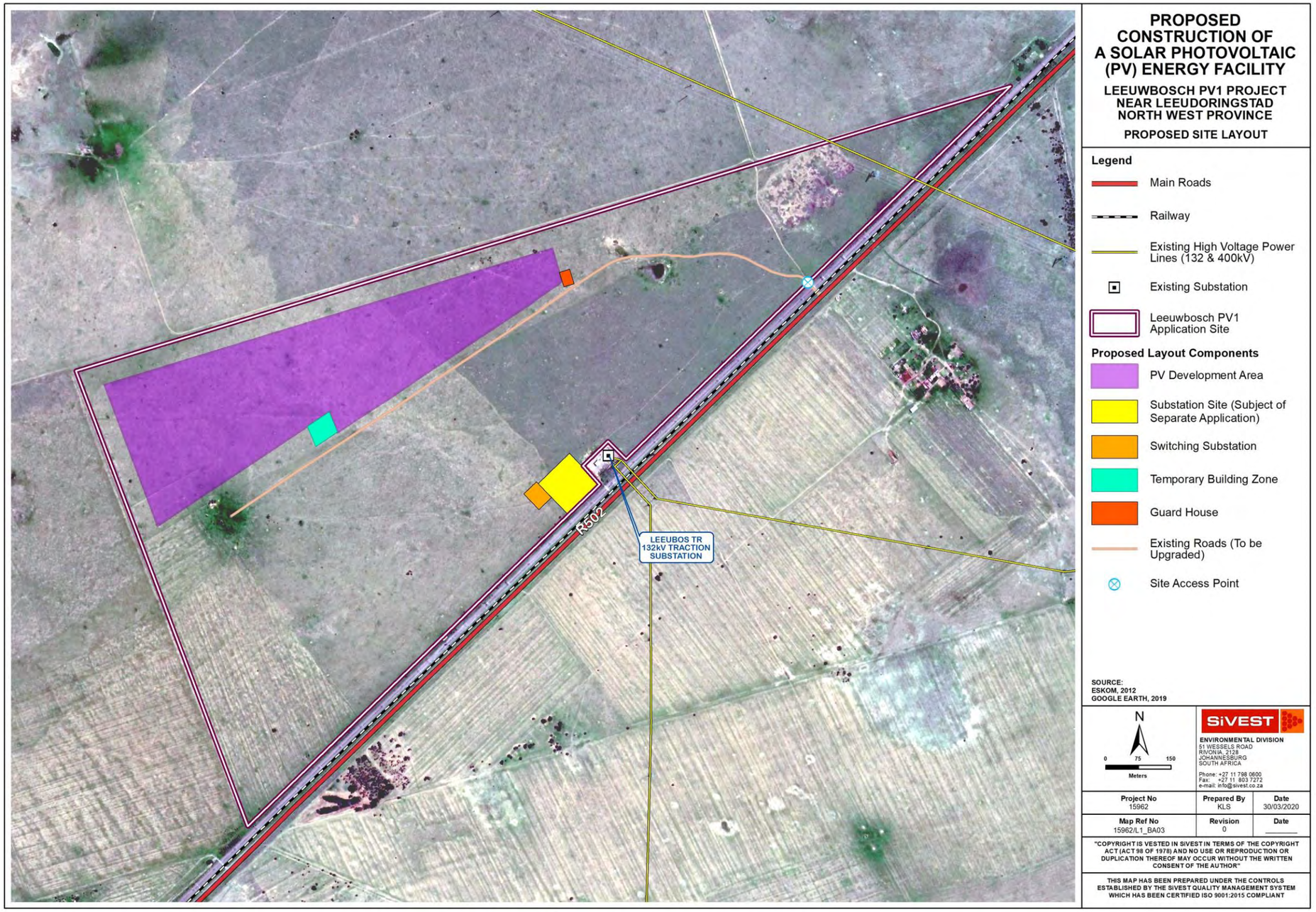


Figure 3-2: Leeuwbosch PV1 Site Layout

4. STORMWATER MANAGEMENT PHILOSOPHY

Development is a process of change or growth that usually involves the construction of buildings, roads and infrastructure which leads to a change in the hydraulic properties of an area. Permeable layers become less permeable or impermeable resulting in increased surface runoff and flood volumes. Conduits are constructed to drain runoff more efficiently resulting in shorter catchment response times and increased peak flows. Natural vegetation is often removed, reducing interception and transpiration and exposing soil to the impact of rain which may lead to increased erosion.

In order to lessen the negative impacts and enhance the positive impacts on the environment as a result of development, responsible management of stormwater is required. This can be achieved through the implementation of various mitigation measures in accordance with drainage requirements and guidelines as set out by the local authority.

Stormwater Management policies require that, for storms of similar recurrence intervals, the post-development runoff from an area may not exceed the runoff generated under the pre-development condition. The study area falls within The Maquassi Hills Local Municipality and, in the absence of site specific design guidelines, the stormwater drainage system should be designed in accordance with the criteria given in the "Red Book" [1] as well as the Drainage Manual[2]. This drainage system can be divided into minor and major stormwater systems.

The minor stormwater system comprises elements that aid in conveying stormwater runoff from within the development and road reserves to the major stormwater system. These elements include catch pits inlet structures, gutters, berms, canals, road verges, pipes and culverts.

The major stormwater system comprises elements of the minor system, road surfaces, natural low points, streams, rivers, wetlands, dams and flood attenuation structures necessary to control and drain stormwater or larger storms without damage and loss of life.

Stormwater runoff shall not be concentrated to an extent that would result in any damage to the downstream riverine ecology and/or built environment during storms with a recurrence interval exceeding 1:10 years and would result in only minor, repairable damage during storms with a recurrence interval exceeding 1:50 years.

To this end, the minor and major stormwater systems shall be designed to convey and withstand the 1:10 and 1:50 year flood events respectively. This is a guideline and the onus is on the design engineer to determine the risks associated with a storm with a specific recurrence interval. For areas where the risk of loss is unacceptably high, a higher recurrence interval and a higher level of service may need to be considered. For larger structures such as bridges and major culverts, the Department of Transport's specific requirements shall be considered.

Drainage systems must be maintained in a clean state, free of any rubbish, debris and matter likely to restrict the flow of stormwater or pose a pollution threat regulated by the departments of Water Affairs & Forestry, Environmental Affairs & Tourism and Health.

The Stormwater Management Philosophy for the development encourages the developer, the professional teams and contractors to do the following:

- Maintain adequate ground cover in all areas at all times to reduce the risk or erosion by wind, water and all forms of traffic;
- Prevent concentration of stormwater flow at any point where the ground is susceptible to erosion. Where unavoidable, adequate protection of the ground must be provided;
- Reduce stormwater flows as much as possible by providing effective attenuation measures;

[1] *Guidelines for Human Settlement Planning and Design compiled by CSIR Building and Construction Technology*
[2] *Drainage Manual 6th Edition, Published by The South African National Roads Agency SOC Ltd, 2013*

- Ensure that development does not increase the rate of stormwater flow above that which the natural ground can safely accommodate at any point;
- Ensure that all stormwater control works are constructed in a safe and aesthetic manner in keeping with the overall development;
- Prevent pollution of waterways and water features;
- Contain soil erosion by constructing protective works to trap sediment at appropriate locations. This applies particularly during construction; and
- Avoid situations where natural or artificial slopes may become saturated and unstable, both during and after the construction process.

The main stormwater management objectives and criteria that are considered to be relevant to the design and planning of stormwater drainage systems include:

- Minimising the threat of flooding;
- Minimising public inconvenience caused by frequent storms;
- Protecting the public and preventing the loss of life due to severe storms and/or malfunctioning drainage systems;
- Preventing erosion and siltation;
- Protection of receiving water bodies;
- Minimising costs;
- Sustainability of stormwater management systems; and
- Environmental and water pollution considerations.

5. HYDROLOGICAL ASSESSMENT

The methods described in the Drainage Manual were used to carry out hydrological assessments of the catchments and site.

5.1. CATCHMENT DESCRIPTION

The catchment is small (3.7km2) and flat (<1%) and falls within the C25A quaternary catchment. It is long and elongated with no evidence of clearly defined watercourses. Overland sheet flow occurs in a south-easterly direction through the site to meet the railway adjacent to the main road (R502). The catchment runoff will eventually discharge into the Klipspruit.

The landuse is predominantly rural grasslands. Soils were classed under the SCS hydrological soil group C, which have a moderately high stormflow potential (slow infiltration rates, shallow soil depths and restricted permeability).

The catchment was subdivided to separate the application site from the upper catchment. This would help determine the runoff entering and leaving the site which may be used in the design of mitigation measures if/where needed.

The site is located safely away from any rivers or floodplains and will therefore not impact on or be impacted by a floodline.

5.2. CATCHMENT CHARACTERISTICS

The contributing catchments and their characteristics were determined using the existing 5m contours and aerial imagery. The catchment characteristics and delineations are illustrated in Figure 5-1 below.

Catchment	1.1	1.2	1 (Combined)
Characteristic	**Value**		
Area (km^2)	2.47	1.26	3.73
Longest flow path (km)	4.97	1.3	6.125
Downstream elevation (m)	1315	1310	1310
Upstream elevation (m)	1345	1320	1345
10-85 height difference (m)	30	10	35
Average slope (m/m)	0.006	0.0077	0.0057
Time of Concentration (hrs)	2.75	1.39	3.07
SDF Basin	7		
SCS Hydrological Soil Group	C		

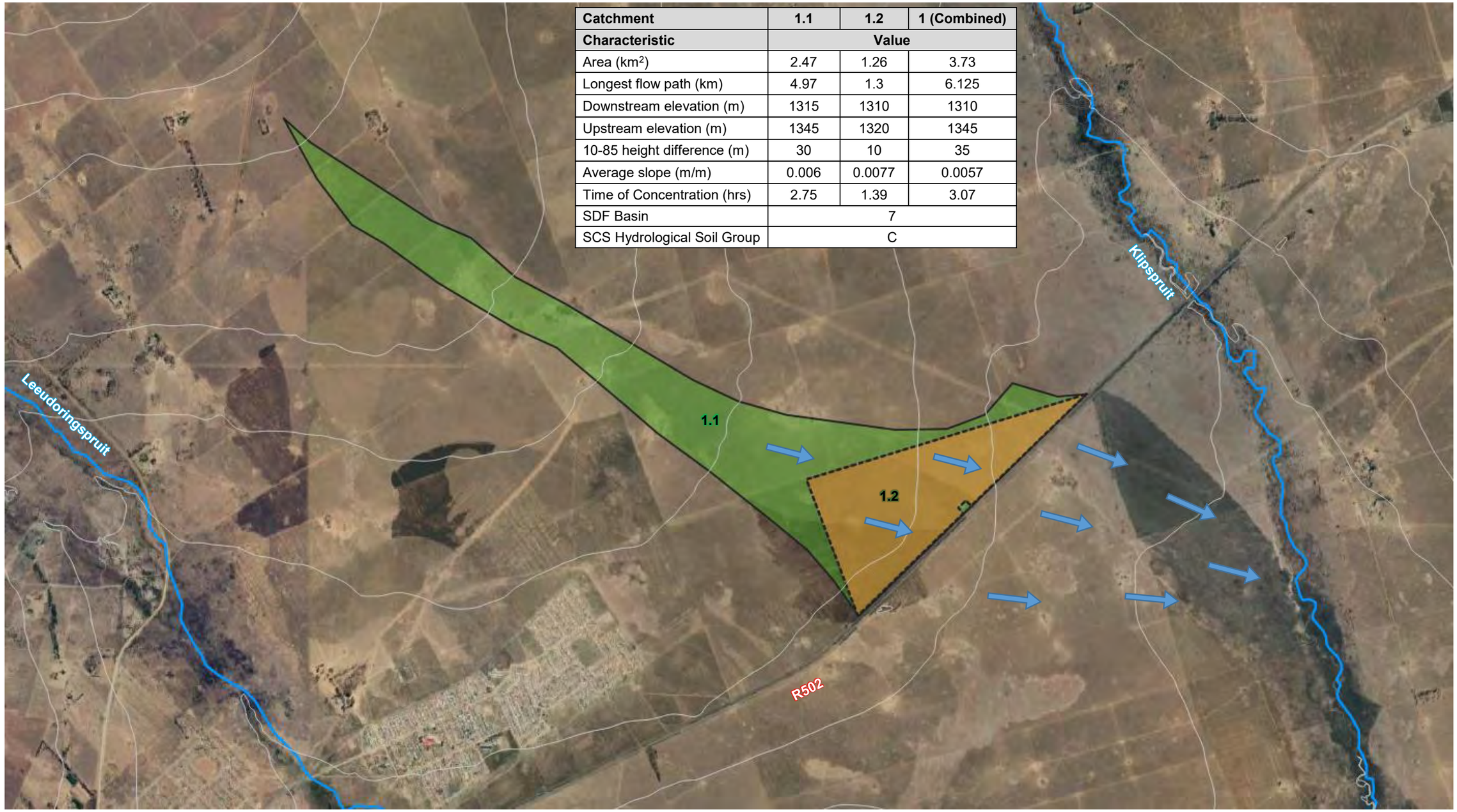


Figure 5-1: Catchments

5.3. CLIMATE

According to the Köppen-Geiger map updated by the CSIR to quantify the current South African climatic conditions, the site is given a BSk classification. This is indicative of a semi-arid climate, with cool, dry winters and warm to hot summers.

December and January are the hottest months of the year with an average temperature of approximately 30°C. June and July are the coldest months of the year with an average temperature of approximately 17°C.

The mean annual precipitation is approximately 550mm with most rainfall occurring mainly during summer. The Design Rainfall Estimation[3] software was used to obtain the rainfall data (tabulated below) required for the runoff calculations.

Table 5-1: Design Rainfall

Return Period		2yr	5yr	10yr	20yr	50yr	100yr	200yr
Duration		Rainfall Depth (mm)						
5	m	9.40	12.70	14.90	17.20	20.30	22.70	25.10
10	m	13.90	18.80	22.20	25.55	30.10	33.70	37.30
15	m	17.55	23.70	28.00	32.20	37.95	42.45	47.05
30	m	22.20	30.00	35.40	40.80	48.05	53.75	59.55
45	m	25.50	34.45	40.65	46.80	55.15	61.70	68.35
60	m	28.10	38.00	44.85	51.65	60.85	68.05	75.40
90	m	32.30	43.60	51.45	59.30	69.85	78.10	86.55
120	m	35.60	48.10	56.75	65.40	77.05	86.15	95.45
240	m	41.65	56.25	66.40	76.45	90.15	100.75	111.65
360	m	45.65	61.65	72.75	83.85	98.75	110.45	122.40
480	m	48.70	65.85	77.65	89.45	105.40	117.85	130.65
600	m	51.25	69.25	81.65	94.10	110.85	123.95	137.40
720	m	53.40	72.15	85.15	98.05	115.55	129.15	143.20
960	m	57.00	76.95	90.85	104.65	123.30	137.80	152.80
1200	m	59.95	80.95	95.55	110.05	129.70	145.00	160.70
1440	m	62.45	84.35	99.55	114.70	135.10	151.10	167.50
1	d	51.95	70.15	82.80	95.40	112.40	125.60	139.30
2	d	63.85	86.35	101.85	117.35	138.20	154.55	171.30
3	d	72.15	97.45	115.00	132.45	156.05	174.45	193.40
4	d	78.25	105.70	124.80	143.70	169.35	189.30	209.85
5	d	83.40	112.65	132.90	153.10	180.45	201.65	223.60
6	d	87.80	118.60	140.00	161.25	190.05	212.40	235.50
7	d	91.75	123.90	146.25	168.50	198.55	221.90	246.00

[3] *Design Rainfall Estimation in South Africa Version 3 developed by MJ Gorven, JC Smithers and RE Schulze*

5.4. PEAK RUNOFF FLOWS

The runoff peak values were calculated using the widely-used Rational Method, which is considered appropriate for catchments less than 15km2. The Rational Method is based on a simplified representation of the law of conservation of mass and the hypothesis that the flow rate is directly proportional to the size of the contributing area and the rainfall intensity, with the latter a function of the return period. It is a method of estimating the runoff in a drainage basin at a specific point in time by means of the rational formula,

$$Q = \frac{CIA}{3.6},$$

where *C* is a runoff coefficient based on the type of surface,
I is the rainfall intensity in mm per hour, and
A is the area in km^2.

Three phases of the project were considered and assessed. These included the pre-development, construction and post-development scenarios.

5.4.1. Pre-Development

The adopted peak flows are tabulated below with the detailed calculations included in Appendix A

Table 5-2: Adopted Pre-Development Peak Runoff Flows

Return Period	1:2	1:5	1:10	1:20	1:50	1:100
Catchment	**Peak Runoff (m^3/s)**					
1.1	3.31	4.47	5.27	6.07	7.16	8.00
1.2	2.76	3.73	4.40	5.07	5.98	6.68
1	4.58	6.20	7.32	8.42	9.92	11.09

5.4.2. Construction Phase

During construction the site will be highly susceptible to erosion and other stormwater-related impacts. Activities such as site clearance, topsoil removal, excavation and compaction of soils due to plant and vehicular traffic all contribute towards reducing infiltration and permeability and increasing stormwater runoff. The construction site will be deemed to be highly impermeable during this phase.

The allowance for the PV1 site amounts to just under a 30Ha footprint which is roughly 25% of the area of Catchment 1.2.

The adopted peak flows are tabulated below with the detailed calculations included in Appendix A

Table 5-3: Adopted Construction Phase Peak Runoff Flows

Return Period	1:2	1:5	1:10	1:20	1:50	1:100
Catchment	**Peak Runoff (m^3/s)**					
1.1	3.31	4.47	5.27	6.07	7.16	8.00
1.2	3.78	5.11	6.03	6.95	8.19	9.16
1	5.11	6.91	8.16	9.38	11.06	12.36

5.4.3. Post-Development

As there are no design plans or details available at this stage of the project, research on similar facilities was undertaken in order to make reasonable assumptions regarding the design of the PV facility. The final detailed design will influence the layout and arrangement of the PV arrays and therefore its footprint. The client has advised that approximately 10Ha will be required to construct a 5MW PV Facility.

It may comprise the following infrastructure:

- Photovoltaic (PV) Panels
- PV mounting structures
- Switching substation
- Transformers
- Internal underground electrical reticulation
- Auxiliary buildings (guardhouse, office etc.)
- Temporary laydown area for the construction phase
- Internal roads (gravel) and perimeter fencing
- Access road off the R502

The estimated portion of land each component will typically occupy is summarised below.

Table 5-4: Typical Landuse Proportions for PV Facility

Component	% of footprint	Area (Ha)	% of Farm (125Ha)
PV Arrays	90%	9	7.2%
Buildings Substations Transformers	5%	0.5	0.4%
Internal and Access Roads	5%	0.5	0.4%

The layout of the PV facility and associated infrastructure will impact on the runoff distribution patterns. It is assumed that the facilities orientation and configuration will be designed to minimise the impact on the natural drainage patterns.

Whilst the PV panels are impervious and occupy the majority of the site area, they will not significantly impact on the runoff volume. They will be mounted on a structure (typically a modular frame or vertical poles) which will keep them elevated above and off the ground. The structure will either be pile driven or require concrete strip footings depending on the soil conditions. The impact of these mounting structures on the effective pervious area is deemed to be negligible.

The hardened (impervious) area of the site amounts to approximately 1Ha which is less than 1% of the total farm portion area, therefore there will be no significant change in the runoff volume post-development.

The adopted peak flows are tabulated below with the detailed calculations included in Appendix A.

Table 5-5: Adopted Post-Development Peak Runoff Flows

Return Period	1:2	1:5	1:10	1:20	1:50	1:100
Catchment	**Peak Runoff (m^3/s)**					
1.1	3.31	4.47	5.27	6.07	7.16	8.00
1.2	2.76	3.73	4.40	5.07	5.98	6.68
1	4.58	6.20	7.32	8.42	9.92	11.09

6. STORMWATER MANGEMENT POLICY

The following rules are to be observed by the owner, developer, professional team, contractors and sub-contractors:

- Development designs must include measures for attenuating the concentration of and, increase in stormwater runoff. The post-development peak flows are to be attenuated back to pre-development conditions;
- Before the commencement of any construction activities, a plan must be agreed upon which details the measures to be implemented to control and prevent erosion during and after construction;

- On-site stormwater control systems, such as swales, berms and attenuation ponds are to be constructed before any other construction commences. These systems are to be monitored and appropriately adjusted as construction progresses to ensure complete stormwater, erosion and pollution control at all times;
- All embankments to be formed must be adequately stabilized;
- Stormwater must not be allowed to pond in close proximity to building foundations;
- An approved landscaping and re-vegetation plan must be implemented immediately after building works have reached a stage where newly established ground cover is not at risk from the construction works;
- No work is to commence without an approved Stormwater Control Plan (SCP). The SCP must describe what stormwater control measures are to be implemented before, during and after construction. Plans must indicate all persons responsible for the design and on-site monitoring during each stage of the implementation of the control measures;
- The SCP must show that all the provisions, regulations and guidelines contained in this document have been considered;
- In the event of a failure to adequately implement the approved SCP, the contractor shall be responsible for making good all consequential damage at his own cost. The developer is therefore advised to ensure that all members of the professional team and contractors are competent to undertake the development work and are adequately insured;
- The management of stormwater run-off during construction will be controlled by the Environmental Management Plan (EMP) as produced by the Environmental Control Officer (ECO). All construction activities within the development must comply with the EMP. This document is supplementary to the EMP and the control measures set out herein are not to be considered all-encompassing as the contractor will also have to adapt his control measures to the varying onsite conditions;
- All elements of the minor stormwater system shall be designed to safely accommodate and convey the 1:10 year storm event to the major stormwater system elements, which will be designed to accommodate the 1:50 year storm event. Exceptions to these capacities are to be made by the design engineer after assessing the risks;
- Attenuation/Detention facilities will be located at appropriately selected sites based on geotechnical, environmental and topographical conditions, including wetland conservation;
- Where conditions permit, open ditches, drains and channels will be used instead of pipes. On steeper slopes, where high flow velocities are anticipated, appropriate linings for all channels must be provided to withstand erosion. Such linings will vary from vegetated earthen to stone pitching and reinforced concrete;
- Flow velocities must be reduced wherever possible to reduce the erosion potential in channels, natural ground and points of flow concentration (typically at outlets);
- Silt, trash and oil traps must be strategically provided to ensure water quality is not compromised and to prevent blockages in the drainage systems;
- Areas within the proposed development that bound on stormwater attenuation areas, near road crossings, watercourse confluences and water features might be subject to flooding. In these situations, all development should take place above the outfall levels with an appropriate freeboard allowance;
- For areas flowing into the development area, potential future development in these sub-catchments should be considered and any stormwater attenuation requirements should be identified. Likewise, consideration must be given to the stormwater flowing out of the development which may impact on the downstream areas and watercourses. Appropriate measures must be taken to ensure any upstream development does not result in an increased flood damage risk downstream; and
- All natural and unlined channels should be inspected for adequate binding of soil by sustainable ground cover. Stone pitching should be used to reinforce channel inverts on steep slopes. Existing wetlands and stormwater attenuation areas should be protected from encroachment by the development.

7. GUIDELINES FOR OWNERS AND DEVELOPERS

The buildings/structures within the development will be required to control stormwater runoff in accordance with the stormwater management philosophy and policies of the local authority / municipality. The following guidelines are intended to assist in the design of the major and minor stormwater systems infrastructure, and to ensure that the objectives of this SWMP are met during the planning, design, construction and operational phases of all developments.

7.1. BUILDINGS

Any building will inevitably result in some degree of flow concentration, or deflection of flow around the building. The developer/owner shall ensure that all stormwater flow paths are protected against erosion. Discharge from the site must be attenuated back to the pre-development state.

Any inlet to a piped system shall be fitted with a screen, or grating to prevent debris and refuse from entering the stormwater system. This must be installed immediately on installation of the infrastructure.

No building works, earthworks, walls or fences may obstruct or encroach on a watercourse inside or outside the site without approved plans that do not compromise the objectives of the Stormwater Management Plan.

7.2. ROOF DRAINAGE

Building designs must ensure that rainfall runoff from roofing and other areas, not subjected to excessive pollution, be efficiently captured for re-use where possible for on-site irrigation and non-potable water uses.

Where storage for re-use and where ground conditions permit, rainwater runoff should be connected to detention areas to maximize groundwater recharge. These detention areas must be designed to contain at least the first hour of a minor storm's runoff without before overflowing.

7.3. PARKING AND PAVED AREAS

Parking or paved areas should be designed to attenuate stormwater runoff to an acceptable degree by allowing ponding or infiltration. Stormwater from such areas must be discharged in a controlled manner either as overland sheet flow or to larger attenuation facilities.

7.4. ROADS

Roads should be designed and graded to avoid concentration of flow along and off the road. Where flow concentration is unavoidable, measures to incorporate the road into the major stormwater system should be taken, with the provision of attenuation storage facilities at suitable points.

Culverts must be designed to ensure that the capacity of the culvert does not exceed the pre-development stormwater flow at that point and attenuation storage should be provided on the upstream side of the road crossing.

Outlet and culvert discharge points into the natural watercourse must be designed to dissipate flow energy and any unlined downstream channel must be adequately protected against soil erosion.

7.5. SUBSURFACE DISPOSAL OF STORMWATER

Any construction providing for the subsurface disposal of stormwater should be designed to ensure that such disposal does not cause slope instability, or areas of concentrated saturation or inundation. Infiltration structures should be integrated into the terrain so as to be unobtrusive and in keeping with the natural surroundings.

7.6. CHANNELS

Channels may be constructed to convey stormwater directly to a natural watercourse where deemed necessary and unavoidable. The channels must be suitably lined to prevent erosion and scour and provide

maximum possible energy dissipation of the flow. Such linings will vary from vegetated earthen to stone pitching and reinforced concrete.

7.7. ENERGY DISSIPATION

Measures should be taken to dissipate flow energy wherever concentrated stormwater flow is discharged down an embankment or erodible slope.

7.8. OPEN TRENCHES

Open trenches should not be left open and unprotected for extended periods and should be progressively backfilled as construction proceeds. Excavated material to be used as backfill must be placed close to the trench on the upstream side to avoid loose material from washing away.

7.9. STOCKPILES

Material is to be stockpiled away from drainage paths. Loose material such as stone, sand or gravel must be covered or kept damp to minimise dust. Temporary silt screens are to be positioned immediately downstream of stockpiles to intercept loose material which may be washed away.

7.10. PHOTOVOLTAIC PANELS

Orientation of panels shall be considered with respect to drainage pattern, flow concentration, drainage area and velocity. Rows perpendicular to the contours may result in higher runoff concentrations, therefore the configuration should be designed and constructed such that the runoff remains as sheet flow across the entire site.

The panels shall be designed and constructed in such a manner as to allow vegetative growth and maintenance beneath and between panels. If the lowest vertical clearance of the panels above the ground is greater than 3m, non-vegetative control measures will be required to prevent/control erosion and scour along the drip line or otherwise provide energy dissipation from the water running off the panels.

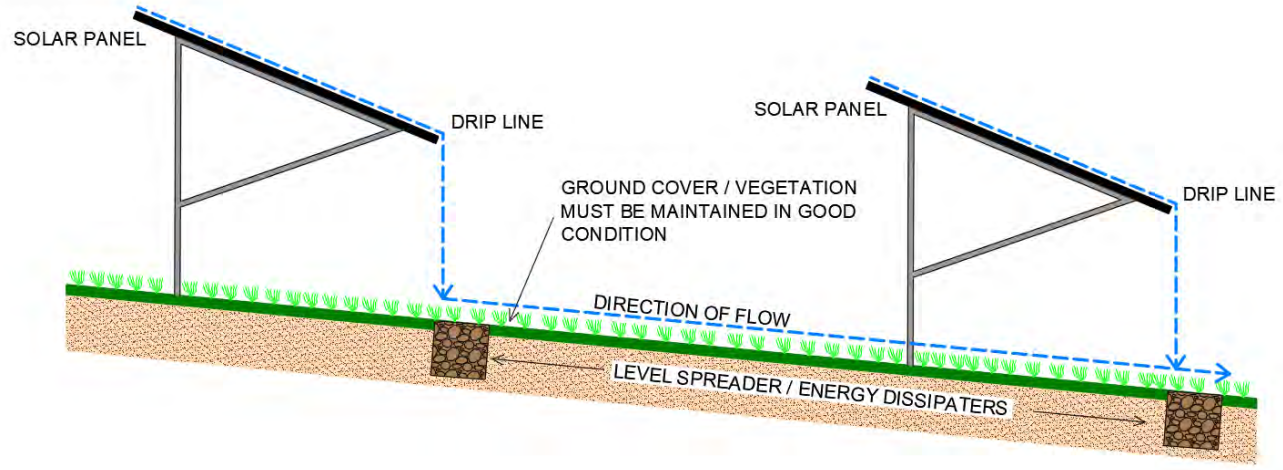


Figure 7-1: Stormwater control of PV panel runoff

7.11. STORMWATER POLLUTION CONTROL

The stormwater systems should be free from any materials that could have a detrimental effect on the fauna, flora and aquatic life in the water systems.

Sites which generate “dirty” (Grey or Black) water must have measures in place that separates the clean and “dirty” water. Depending on the nature of the “dirty” water, this must either be discharged into the wastewater system or contained on site for treatment or packaging before being re-used or disposed of. It is important

that the wastewater system does not flood and overflow into the stormwater systems and designers must ensure there is sufficient capacity for the wastewater system to receive this “dirty” water.

Any site that is required to store substances that could be regarded as hazardous in terms of water pollution must take measures to ensure spillages of such substances can be adequately contained and prevent contamination of the water resources within the development area.

8. COMPLIANCE WITH STORMWATER MANGEMENT POLICY

This document should be read in conjunction with the EMP. The developer, owner and professional team, shall be responsible for ensuring that the requirements and conditions as set out in the EMP are to be adhered to.

The developer, owner and the professional team shall be responsible for the performance of all stormwater control measures implemented on the site and the impact such works may have on downstream or neighbouring properties. Approval of any plan or document shall not be construed as absolving the developer, owner, and professional teams of this responsibility.

9. CONCLUSIONS & RECOMMENDATIONS

The following may be concluded:

- The hydrological assessment (Section 5) reveals that the proposed development/infrastructure will have a minimal impact on the stormwater quality and quantities post-development (operational phase).
- The highest impact will occur during the construction phase and it is important that these impacts are strictly managed under the advisement of the guidelines set out in this document.
- The need for formal stormwater interventions can be minimised if the development is designed to maintain the existing drainage patterns. Overland flow via poorly-defined drainage paths will be the primary form of conveyance.
- A detailed stormwater management plan describing and illustrating the proposed stormwater and erosion control measures must be prepared by the Civil Engineers during the detailed design phase.

It is recommended that:

- The policy described in Section 6 be implemented.
- The guidelines described in Section 7 be incorporated into the detailed design of the development.

Annexure A:

Calculations

Pre-Development Runoff Calculations

Catchment 1.1

Return Period	Tc (hrs)	Rainfall (mm)	Intensity (mm/hr)	A (Km^2)	C	Q (m^3/s)
1:2yr	2.75	37.9	13.78	2.47	0.35	3.31
1:5yr	2.75	51.2	18.62	2.47	0.35	4.47
1:10yr	2.75	60.4	21.96	2.47	0.35	5.27
1:20yr	2.75	69.5	25.27	2.47	0.35	6.07
1:50yr	2.75	82	29.82	2.47	0.35	7.16
1:100yr	2.75	91.6	33.31	2.47	0.35	8.00

Catchment 1.2

Return Period	Tc (hrs)	Rainfall (mm)	Intensity (mm/hr)	A (Km^2)	C	Q (m^3/s)
1:2yr	1.39	31.3	22.52	1.26	0.35	2.76
1:5yr	1.39	42.3	30.43	1.26	0.35	3.73
1:10yr	1.39	49.9	35.90	1.26	0.35	4.40
1:20yr	1.39	57.5	41.37	1.26	0.35	5.07
1:50yr	1.39	67.8	48.78	1.26	0.35	5.98
1:100yr	1.39	75.8	54.53	1.26	0.35	6.68

Catchment 1 (Combined Catchment)

Return Period	Tc (hrs)	Rainfall (mm)	Intensity (mm/hr)	A (Km^2)	C	Q (m^3/s)
1:2yr	3.07	38.8	12.64	3.73	0.35	4.58
1:5yr	3.07	52.5	17.10	3.73	0.35	6.20
1:10yr	3.07	62	20.20	3.73	0.35	7.32
1:20yr	3.07	71.3	23.22	3.73	0.35	8.42
1:50yr	3.07	84	27.36	3.73	0.35	9.92
1:100yr	3.07	93.9	30.59	3.73	0.35	11.09

Construction Phase Runoff Calculations

Catchment 1.1

Return Period	Tc (hrs)	Rainfall (mm)	Intensity (mm/hr)	A (Km^2)	C	Q (m^3/s)
1:2yr	2.75	37.9	13.78	2.47	0.35	3.31
1:5yr	2.75	51.2	18.62	2.47	0.35	4.47
1:10yr	2.75	60.4	21.96	2.47	0.35	5.27
1:20yr	2.75	69.5	25.27	2.47	0.35	6.07
1:50yr	2.75	82	29.82	2.47	0.35	7.16
1:100yr	2.75	91.6	33.31	2.47	0.35	8.00

Catchment 1.2

Return Period	Tc (hrs)	Rainfall (mm)	Intensity (mm/hr)	A (Km^2)	C	Q (m^3/s)
1:2yr	1.39	31.3	22.52	1.26	0.48	3.78
1:5yr	1.39	42.3	30.43	1.26	0.48	5.11
1:10yr	1.39	49.9	35.90	1.26	0.48	6.03
1:20yr	1.39	57.5	41.37	1.26	0.48	6.95
1:50yr	1.39	67.8	48.78	1.26	0.48	8.19
1:100yr	1.39	75.8	54.53	1.26	0.48	9.16

Catchment 1 (Combined Catchment)

Return Period	Tc (hrs)	Rainfall (mm)	Intensity (mm/hr)	A (Km^2)	C	Q (m^3/s)
1:2yr	3.07	38.8	12.64	3.73	0.39	5.11
1:5yr	3.07	52.5	17.10	3.73	0.39	6.91
1:10yr	3.07	62	20.20	3.73	0.39	8.16
1:20yr	3.07	71.3	23.22	3.73	0.39	9.38
1:50yr	3.07	84	27.36	3.73	0.39	11.06
1:100yr	3.07	93.9	30.59	3.73	0.39	12.36

Post-Development Runoff Calculations

Catchment 1.1

Return Period	Tc (hrs)	Rainfall (mm)	Intensity (mm/hr)	A (Km^2)	C	Q (m^3/s)
1:2yr	2.75	37.9	13.78	2.47	0.35	3.31
1:5yr	2.75	51.2	18.62	2.47	0.35	4.47
1:10yr	2.75	60.4	21.96	2.47	0.35	5.27
1:20yr	2.75	69.5	25.27	2.47	0.35	6.07
1:50yr	2.75	82	29.82	2.47	0.35	7.16
1:100yr	2.75	91.6	33.31	2.47	0.35	8.00

Catchment 1.2

Return Period	Tc (hrs)	Rainfall (mm)	Intensity (mm/hr)	A (Km^2)	C	Q (m^3/s)
1:2yr	1.39	31.3	22.52	1.26	0.35	2.76
1:5yr	1.39	42.3	30.43	1.26	0.35	3.73
1:10yr	1.39	49.9	35.90	1.26	0.35	4.40
1:20yr	1.39	57.5	41.37	1.26	0.35	5.07
1:50yr	1.39	67.8	48.78	1.26	0.35	5.98
1:100yr	1.39	75.8	54.53	1.26	0.35	6.68

Catchment 1 (Combined Catchment)

Return Period	Tc (hrs)	Rainfall (mm)	Intensity (mm/hr)	A (Km^2)	C	Q (m^3/s)
1:2yr	3.07	38.8	12.64	3.73	0.35	4.58
1:5yr	3.07	52.5	17.10	3.73	0.35	6.20
1:10yr	3.07	62	20.20	3.73	0.35	7.32
1:20yr	3.07	71.3	23.22	3.73	0.35	8.42
1:50yr	3.07	84	27.36	3.73	0.35	9.92
1:100yr	3.07	93.9	30.59	3.73	0.35	11.09

SiVEST SA (Pty) Ltd
Civil Engineering Division

VCC Estate, North View Building
170 Peter Brown Drive, Bush Shrike Close
Montrose, Pietermaritzburg 3201
KwaZulu-Natal, South Africa
PO Box, 707, Msunduzi. 3231
KwaZulu-Natal, South Africa

Tel +27 33 437 1600
Fax +27 33 347 5762
Email info@sivest.co.za
www.sivest.co.za

Contact Person: Vaseelan Moodley
Cell No.: 072 58 58 247
Email: vaseelanm@sivest.co.za

ANNEXURE G
WETLAND REHABILITATION PLAN

LEEUWBOSCH PV GENERATION (PTY) LTD

Proposed Construction of Solar Photovoltaic (PV) Energy Facilities (PV 1 & PV2) on Portion 37 of the Farm Leeuwbosch No. 44 near Leeudoringstad, North West Province

Wetland Rehabilitation Plan

Issue Date: January 2021
Revision No.: 1
Project No.: 15962

Date:	January 2021
Document Title:	Proposed Construction of Solar Photovoltaic (PV) Energy Facilities (PV1 & PV2) on Portion 37 of the Farm Leeuwbosch No. 44 near Leeudoringstad, North West Province – Wetland Rehabilitation Plan
Author:	Stephen Burton
Revision Number:	1
Checked by:	Liandra Scott-Shaw
Approved by:	John Richardson
Signature:	
For:	Leeuwbosch PV Generation (Pty) Ltd

Confidentiality Statement

LEEUWBOSCH PV GENERATION (PTY) LTD

PROPOSED CONSTRUCTION OF SOLAR PHOTOVOLTAIC (PV) ENERGY FACILITIES ON PORTION 37 OF THE FARM LEEUBOSCH 44 NEAR LEEUDORINGSTAD, NORTH WEST PROVINCE

WETLAND REHABILITATION PLAN

Contents **Page**

Table of Contents

LIST OF TABLES

LEEUWBOSCH PV GENERATION (PTY) LTD

PROPOSED CONSTRUCTION OF UP TO A 9.9 MW SOLAR PHOTOVOLTAIC (PV) ENERGY FACILITY ON PORTION 37 OF THE FARM LEEUBOSCH 44 NEAR LEEUDORINGSTAD, NORTH WEST PROVINCE

WETLAND REHABILITATION PLAN

1 REHABILITATION MANAGEMENT PLAN

This Wetland Rehabilitation Plan is designed to manage, maintain and improve the PES and EIS of the wetland areas and surrounding terrestrial areas within the study area, with particular emphasis on the impacts that the upgrading of a road crossing within the study area may have on the drainage line and wetland areas.

1.1 Rehabilitation objectives

The objectives of this plan are to:

- Ensure as far as is practicable that the measures contained in the report are implemented;
- Manage activities within the study area in order to maintain and/ or improve ecological integrity of the study area;
- Minimise adverse impacts on the receiving environment;
- Maximise the service provision and ecological functioning of the watercourse and wetland areas;
- Maximise the ecological functioning of the watercourse and wetland system and;
- Monitor the impact of the project on the receiving environment.

1.2 Rehabilitation context

The rehabilitation and management plan fits into the overall planning process of the development activities and should be implemented by the proponent as soon as possible once construction on the road has reached a stage where rehabilitation activities become viable. This document serves as a rehabilitation and management plan to manage the ecological characteristics of the study area during the design, construction/implementation and post-rehabilitation/operational phases of the development.

1.3 Monitoring of the rehabilitation works

During implementation/construction, the monitoring of the rehabilitation works will form part of the activities of the Environmental Control Officer (ECO). Monitoring should include, but not be limited to, the following parameters:

- Determining if the final landforms of backfilled and reprofiled areas are in line with the natural surroundings;
- Assessment of surface and slope stability;
- Assessment of adequate functioning of rehabilitation structures;
- Measuring the depth of topsoil replaced within rehabilitated areas;
- Determining erosion levels;
- Calculating ground cover percentages within revegetated areas including vegetation basal cover, litter and rock; and
- Determining plant community composition and structure of rehabilitated areas.

Upon completion of rehabilitation works on site, the ECO or a suitably qualified specialist should continue to monitor the rehabilitation works for three months on a monthly basis. Thereafter, one monitoring site visit is recommended after 6 months from completion of rehabilitation works and final sign-off of rehabilitation works should take place after one year.

1.4 Roles and responsibilities

The construction contractor or consulting engineers will be responsible for the appointment of the ECO and relevant specialists and contractors to perform rehabilitation and monitoring activities as well as alien vegetation removal and control.

Implementation/Construction Phase

- The ECO will ensure that the contractor and all subcontractors are aware of all the specifications pertaining to the project;
- Any damage to the environment will be repaired as soon as possible after consultation between the ECO, Consulting Engineer and Contractor;
- The ECO will ensure that the project staff and/or contractor are adhering to all stipulations of the Rehabilitation Management Plan;
- The ECO will be responsible for monitoring the rehabilitation works throughout the project by means of site visits and meetings. All site visits and meetings will be documented as part of the site meeting minutes which will be made available for inspection at any time;
- The ECO will ensure that all clean up and rehabilitation or any remedial actions required are completed swiftly as and when required.
- The contractor should not be permitted to leave site until the rehabilitation works have been signed off by a suitably qualified ECO.

Post-rehabilitation/Operational Phase

- During the operational phase, the body that presides over the administration of the development will be responsible for the maintenance of the rehabilitation plan and management thereof. This is particularly pertinent with reference to the two year monitoring of alien vegetation, as well as erosion and incision control for the operational life of the development as defined in this rehabilitation plan.

1.5 Mitigation and management

The section below will define and describe the various environmental impacts affecting the integrity of the wetland areas associated with the development activities and proposed management and mitigation measures related to each impact will be presented.

The table below serves to describe and explain the rehabilitation and management measures deemed necessary to effectively manage, maintain, rehabilitate and improve the ecological characteristics and functioning of the study area

2 WETLAND REHABILITATION PLAN

Table 1: Mitigation and Rehabilitation Measures

Impact	Activity resulting in impact	Mitigation and Rehabilitation Measures
Sedimentation during construction.	Clearance of Vegetation and Levelling in the Local Catchment for PV array, Operation and Maintenance Buildings	- Vegetation clearing must take place in a phased manner, only clearing areas where construction will take place and not additional areas where construction will only take place in the future. - Adequate structures must be put into place (temporary or permanent where necessary in extreme cases) to deal with increased/accelerated run-off and sediment volumes. The use of silt fencing and potentially sandbags or hessian “sausage” nets or other appropriate measures along the boundaries of the PV array bases are to be used where necessary to prevent run-off containing sediment entering the watercourse as well as potential erosion in susceptible areas near to the watercourse and the associated buffer zone. - An appropriate construction storm water management plan formulated by a suitably qualified professional must accompany the proposed development to deal with increased run-off in the designated construction areas.
Change in flow rate during construction	Clearance of Vegetation and Levelling in the Local Catchment for PV array, Operation and Maintenance Buildings	- Adequate structures must be put into place (temporary or permanent where necessary in extreme cases) to deal with increased/accelerated run-off and sediment volumes. The use of silt fencing and potentially sandbags or hessian “sausage” nets or other appropriate measures along the boundaries of the PV array bases can be used where necessary to prevent run-off containing sediment entering the watercourses as well as potential erosion in susceptible areas near to the watercourses and the associated buffer zones.

Impact	Activity resulting in impact	Mitigation and Rehabilitation Measures
Vehicles and machinery my leak oil	Vehicles and machinery my leak oil which can accumulate in storm water run-off generated on the construction site and enter the wetlands downstream. Additionally, stored fuels, oils and other hazardous substances may leak from storage areas and enter the downstream wetlands via storm water run-off.	-All oils, fuels and hazardous substances or liquids must not be stored within 100m from the full extent of the watercourses and the associated buffer zones, unless such storage is unavoidable and approved by the ECO. Where these items are stored within 100m from the full extent of the watercourse, the storage area must be adequately bunded to contain any spillage from containers. Emergency spill kits must be available to clean up and remove spills. -All vehicles and machinery operating on the study site are to be checked for oil, fuel or any other fluid leaks before entering the construction areas. All vehicles and machinery must be regularly serviced and maintained before being allowed to enter the construction areas. No fuelling, re-fuelling, vehicle and machinery servicing or maintenance is to take place within 100m of the watercourses and the associated buffer zones. -The study site is to contain sufficient safety measures throughout the construction process. Safety measures include (but are not limited to) oil spill kits and the availability of fire extinguishers. Additionally, fuel, oil or hazardous substances storage areas must be bunded to 110% capacity to prevent oil or fuel contamination of the ground and / or nearby watercourses and the associated buffer zones. -No cement mixing is to take place in the watercourse or the associated buffer zones. In general, any cement mixing should take place over a bin lined (impermeable) surface or alternatively in the load bin of a vehicle to prevent the mixing of cement with the ground. Cement / concrete can also be trucked in readymix vehicles. Importantly, no mixing of cement or concrete directly within the watercourse and associated buffer zone.

Impact	Activity resulting in impact	Mitigation and Rehabilitation Measures
Sedimentation during operation.	Increased Hardened Surfaces in the Local Catchment due to PV array bases	- Adequate structures, where required, must be put into place to deal with increased/accelerated run-off and associated sediment volumes. The use of energy dissipating structures where required to prevent increased run-off and sediments contained in the run-off entering the watercourse can be used. - An appropriate operational storm water management plan formulated by a suitably qualified professional must accompany the proposed development to deal with sedimentation and increased run-off on site.
Change in flow rate during operation.	Increased Hardened Surfaces in the Local Catchment due to PV array bases	- Adequate structures, where required, must be put into place to deal with increased/accelerated run-off and associated sediment volumes. The use of energy dissipating structures where required (preferably surrounding the PV array bases and access roads) to prevent increased run-off and sediments contained in the run-off entering the watercourse can be used. - An appropriate operational storm water management plan formulated by a suitably qualified professional must accompany the proposed development to deal with sedimentation and increased run-off on site. - An appropriate operational storm water management plan formulated by a suitably qualified professional must accompany the proposed development to deal with sedimentation and increased run-off on site.

3 CONCLUSIONS

A number of impacts including invasion of the wetland areas by alien plant species, further erosion, siltation, loss of bank stability and an increase in soil compaction have been identified, which may occur as a result of the proposed development and therefore requires suitable management during the implementation/construction and post-rehabilitation/operational phases thereof.

A Riparian and Wetland Rehabilitation Plan including management measures was developed to effectively manage, maintain and improve the ecological characteristics of the study area.

The measures as set out in the Riparian and Wetland Rehabilitation Plan are deemed sufficient for the conservation of ecological processes and provide a tool for managing and improving the current ecological state of the area. If the measures as set out in the rehabilitation plan are adhered to, ecological processes within the area will not only re-establish, but also allow for the continued improvement of the functionality of the wetland

ANNEXURE H
PLANT RESCUE PLAN

TO BE INCLUDED IN FINAL EMPr PRIOR TO CONSTRUCTION

ANNEXURE I
ECOLOGICAL MANAGEMENT PLAN

TO BE INCLUDED IN FINAL EMPr PRIOR TO CONSTRUCTION

ANNEXURE J
ALIEN PLANT MANAGEMENT PLAN

TO BE INCLUDED IN FINAL EMPr PRIOR TO CONSTRUCTION

ANNEXURE K
RE-VEGETATION AND REHABILITATION PLAN

TO BE INCLUDED IN FINAL EMPr PRIOR TO CONSTRUCTION

ANNEXURE L
OPEN SPACE MANAGEMENT PLAN

TO BE INCLUDED IN FINAL EMPr PRIOR TO CONSTRUCTION

ANNEXURE M
TRAFFIC MANAGEMENT PLAN

TO BE INCLUDED IN FINAL EMPr PRIOR TO CONSTRUCTION

ANNEXURE N
TRANSPORTATION PLAN

TO BE INCLUDED IN FINAL EMPr PRIOR TO CONSTRUCTION

ANNEXURE O
REHABILITATION PLANS

TO BE INCLUDED IN FINAL EMPr PRIOR TO CONSTRUCTION

SiVEST SA (Pty) Ltd
Environmental Division

4 Pencarrow Crescent
La Lucia Ridge Office Estate,
Umhlanga Rocs. 4320
KwaZulu-Natal, South Africa
PO Box 1899, Umhlanga Rocks. 4320.
KwaZulu-Natal, South Africa

Tel +27 31 581 1500
Fax +27 31 566 2371
Email info@sivest.co.za
www.sivest.co.za

Contact Person: Stephan Jacobs
Tel No.: 031 581 1573
Email: stephanj@sivest.co.za