PROPOSED MATJHABENG SOLAR PV WITH BATTERY ENERGY STORAGE SYSTEMS PROJECT:
PHASE 1 AND PHASE 2 SITES

ENVIRONMENTAL IMPACT ASSESSMENT REPORT

DRAFT

August 2021

NEMAI CONSULTING

Environmental, Social and OHS Consultants

P.O. Box 1673
Sunninghill
2157

147 Bram Fisher Drive
Ferndale
2194

Tel: 011 781 1730
Fax: 011 781 1731
Email: info@nemai.co.za

TITLE AND APPROVAL PAGE

Project Name:	Proposed Matjhabeng Solar PV with Battery Energy Storage Systems Project: Phase 1 and Phase 2 Sites
Report Title:	Environmental Impact Assessment Report
Authority Reference:	*To be assigned*
Report Status:	Draft

Applicant:	SunElex Energy (Pty) Ltd

Prepared By:	Nemai Consulting (Pty) Ltd		
NEMAI CONSULTING	☎ +27 11 781 1730		147 Bram Fischer Drive, FERNDALE, 2194
	🖷 +27 11 781 1731		
	✉ donavanh@nemai.co.za		PO Box 1673, SUNNINGHILL, 2157
	www.nemai.co.za		
Report Reference:	10716-20210811-dEIAR		R-PRO-REP|20170216

	Name	Date
Authors:	D. Henning	11/08/2021
Reviewed By:	N. Naidoo	11/08/2021

EXECUTIVE SUMMARY

A. PROJECT BACKGROUND AND MOTIVATION

Electricity generation sources need to be diversified to ensure security of supply and reduction in the carbon footprint created by the current heavy reliance of South Africa on coal to produce electricity.

SunElex Energy (Pty) Ltd (the Applicant) has proposed the development of the Matjhabeng 400 MW Solar Photovoltaic Power Plant with 80 MW (320 MWh) Battery Energy Storage Systems (hereinafter the 'Project'), which is located north and south of the town of Odendaalsrus in the Free State Province. The proposed Project will be developed to serve the Matjhabeng Local Municipality's energy requirements and will generate power for delivery to the local/national grid. The electricity generated by the Project will be injected into the existing Eskom 132 kV distribution system.

This document serves as the Draft Environmental Impact Assessment Report for the proposed Project: Phase 1 and Phase 2 Sites.

B. PROJECT LOCATION

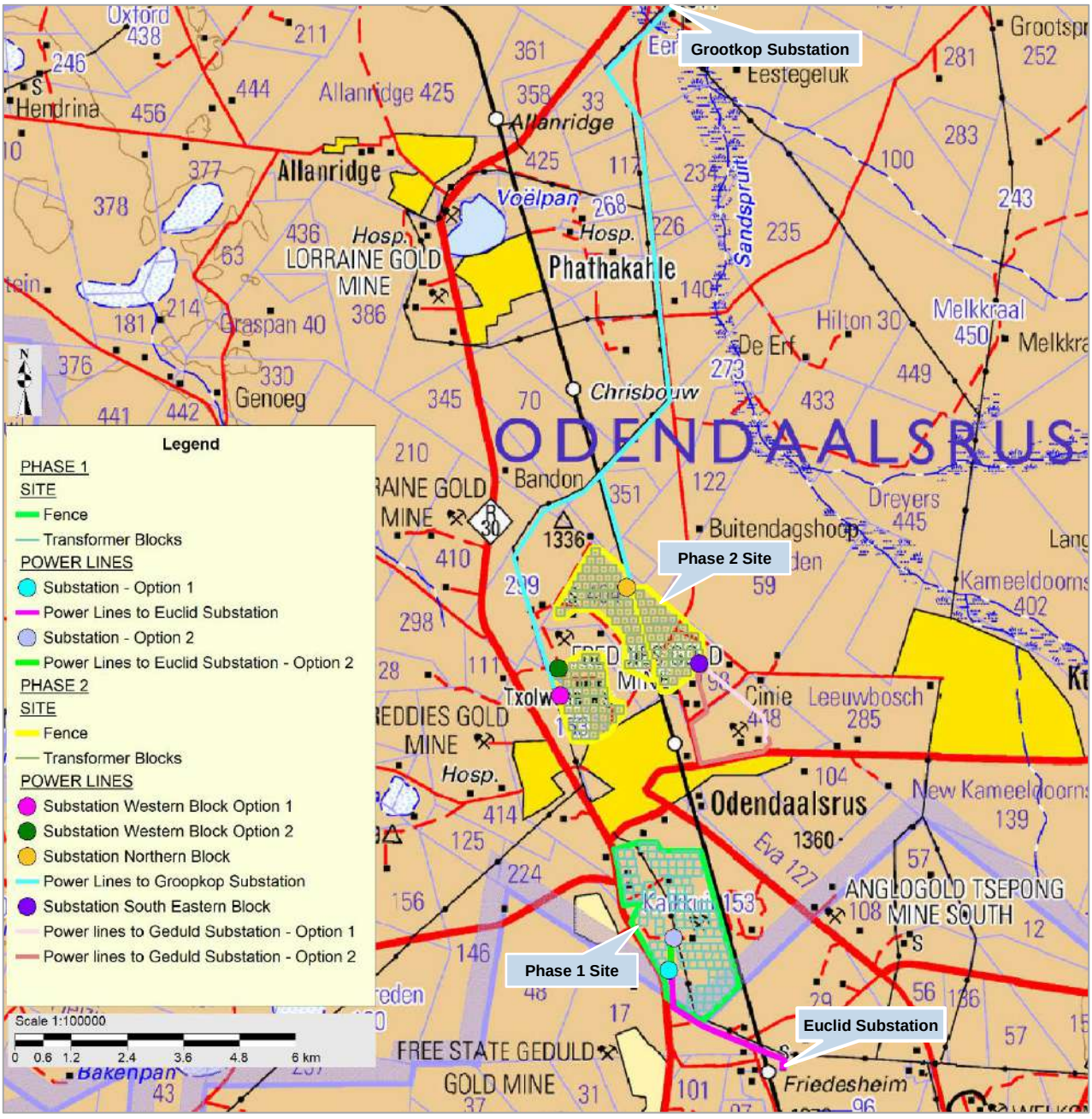
The rationale for the Project is based on its geographic location and the suitability of the sites (high solar yield area, flat and sparsely populated land, grid connection, water supply, good transport infrastructure, availability of a large portion of municipal land) and the value it provides to the Matjhabeng Local Municipality and users of electricity/energy to be generated by the proposed Project.

The Project is located in the north-western part of the Free State Province and falls within the Matjhabeng Local Municipality and Lejweleputswa District Municipality. The Phase 1 and Phase 2 Sites are located south and north of Odendaalsrus, respectively (see figure to follow for locality of overall Project). The sites are easily accessible from the north and south by the R30 arterial road (traversing both sites) and from the east and west via the R34 arterial road.

The electricity generated by the Project will be injected into the existing Eskom 132 kV distribution system as follows (a separate Basic Assessment is being undertaken for the proposed power lines and substations):

- Phase 1:
  - Proposed new 132kV overhead power lines between the on-site substation and the existing Eskom Euclid Substation located to the south-east of the Phase 1 Site.
- Phase 2:
  - Northern and western blocks – proposed new 132kV overhead power lines between the on-site substations and the existing Eskom Grootkop Substation located to the north of the Phase 2 Site; and

- South-eastern block – proposed new 132kV overhead power line between the on-site substation and the existing Eskom Geduld Substation located to the south-east of the Phase 2 Site.



Locality map of overall Project Area

(Note: not all components of the Phase 1 and Phase 2 Facilities are shown)

C. LEGISLATION AND GUIDELINES CONSIDERED

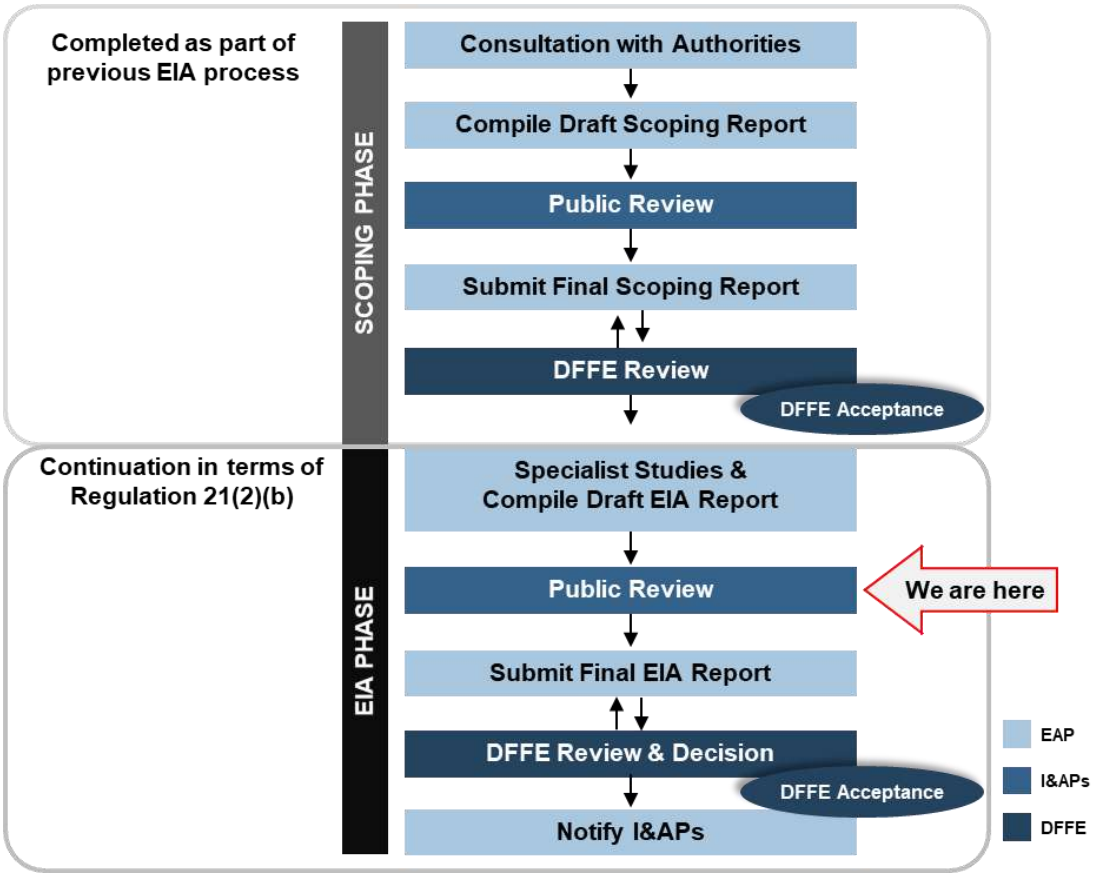
Pertinent legislation that has possible bearing on the proposed Phase 1 and Phase 2 Sites from an environmental perspective is briefly discussed in the Environmental Impact Assessment Report.

The relationship between the Project and the following key pieces of environmental legislation is also explained:

- National Environmental Management Act (No. 107 of 1998);
- National Environmental Management: Waste Act (Act No. 59 of 2008);
- National Water Act (Act No. 36 of 1998);
- Mineral and Petroleum Resources Development Act (Act No. 28 of 2002);
- National Environmental Management Air Quality Act (Act No. 39 of 2004);
- National Environmental Management: Biodiversity Act (Act No. 10 of 2004); and
- National Heritage Resources Act (Act No. 25 of 1999).

D. SCOPING AND ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

An Application for Environmental Authorisation in terms of the National Environmental Management Act (Act No. 107 of 1998) and the Environmental Impact Assessment Regulations of 2014 (as amended) has been made for the proposed Project. In terms of the aforementioned Act, the lead decision-making authority for the environmental assessment is the Department of Forestry, Fisheries and the Environment. The process for seeking authorisation is undertaken in accordance with Government Notice No. R. 982 of 4 December 2014 (as amended). Based on the types of activities involved, the requisite environmental assessment for the Project: Phase 1 and Phase 2 Sites is a Scoping and Environmental Impact Assessment. An outline of the process is provided in the diagram to follow.



Overview of Scoping and Environmental Impact Assessment Process

E. PROJECT DESCRIPTION

The following components of the proposed Solar PV Facility are explained in the Environmental Impact Assessment Report:

- Solar PV panels/modules;
- Single axis trackers;
- Inverters;
- Low voltage AC cabling;
- Medium voltage step-up transformers;
- Medium voltage AC cabling;
- High voltage substations;
- Guardhouses, operation, maintenance and visitor centre buildings;
- Roads;
- Fencing, security and lighting; and
- Stormwater infrastructure.

In terms of the Project's Battery Energy Storage Systems, the number of battery containers will vary depending on the energy density of the selected battery chemistry. The facility size for each phase of 40MW/ 160MWh battery storage will be approximately 60 units each sized at 7m length x 1.6m width x 2.5m high. Level and fenced off platforms would be created for the battery storage areas of approximately 2 000m². The location of the battery energy storage facility will be adjacent to the 132/33kV solar farm's on-site substations.

The project-lifecycle as well as resources and services required for construction and operation are explained within the Environmental Impact Assessment Report.

F. PROFILE OF THE RECEIVING ENVIRONMENT

The Environmental Impact Assessment Report provides a general description of the status quo of the receiving environment in the Project area. This serves to provide the context within which the assessment was conducted and allows for an appreciation of sensitive environmental features and possible receptors of the effects of the proposed Project.

The receiving environment is explained in terms of the following:

- Land Use and Land Cover
- Climate
- Geology and Geohydrology
- Soils
- Topography
- Surface Water
- Flora & Fauna
- Socio-Economic Environment
- Planning
- Existing Structures and Infrastructure
- Transportation
- Air quality
- Noise
- Cultural Heritage & Palaeontological Features
- Aesthetic Qualities
- Health

G. SPECIALIST STUDIES

The specialist studies 'triggered' by the nature of the proposed development and its receiving environment, which aimed at addressing the key issues and compliance with legal obligations, include the following:

1. Water Resources Impact Assessment;
2. Terrestrial Ecology Assessment;
3. Avifaunal Assessment;
4. Agricultural Impact Assessment;
5. Phase 1 Cultural Heritage Impact Assessment;
6. Desktop Paleontological Assessment;
7. Visual Impact Assessment;
8. Traffic Impact Assessment;
9. Radiological Survey; and
10. Socio-Economic Impact Assessment.

The information obtained from the respective specialist studies was incorporated into the Environmental Impact Assessment Report in the following manner (amongst others):

1. The information was used to complete the description of the receiving environment in a more detailed and site-specific manner;
2. A summary of each specialist study is provided, focusing on the approach to each study, key findings and conclusions drawn;
3. The specialists' impacts assessment, and the identified mitigation measures, were included in the overall project impact assessment;
4. The evaluations performed by the specialists on the alternatives of the Project components were taken into consideration in the identification of the most favourable options; and
5. Salient recommendations made by the specialists were taken forward to the final Conclusions.

H. IMPACT ASSESSMENT

The Environmental Impact Assessment Report assessed the pertinent environmental impacts that could potentially be caused during the pre-construction, construction and operational phases of the Project.

Impacts were identified as follows:

- Impacts associated with listed activities contained in Government Notice No. R. 983, R. 984 and R. 985 of 4 December 2014, as amended, for which Environmental Authorisation have been applied for;
- Impacts identified during the Scoping phase;
- An appraisal of the Project's activities and components;
- An assessment of the receiving biophysical, social, economic and built environments;
- Findings from specialist studies;

- Issues highlighted by environmental authorities; and
- Comments received during public participation.

The impacts and the proposed management measures are discussed on a qualitative level and thereafter quantitatively assessed to ultimately determine the significance of the impacts. The assessment considered impacts before and after mitigation, where in the latter instance the residual impact following the application of the mitigation measures is evaluated.

The proposed mitigation of the impacts associated with the Project includes specific measures identified by the technical team (including engineering solutions) and environmental specialists, stipulations of environmental authorities and environmental best practices. The Environmental Management Programme provides a comprehensive list of mitigation measures for specific elements of the Project, which extends beyond the impacts evaluated in the body of the Environmental Impact Assessment Report.

The implications of the “no-go option” are also assessed. The “no go option” was considered in light of the motivation as well as the need and desirability of the overall Project. In contrast, should the proposed Project not go ahead, any potentially significant environmental issues associated with the Project would be irrelevant and the status quo of the local receiving environment would not be affected by the Project-related activities. The objectives of this Project would, however, not be met. This will *inter alia* mean that the Project’s intended benefits to Matjhabeng Local Municipality will not be realised. The “no-go option” is thus not preferred.

Cumulative impacts were evaluated in terms of renewable energy projects in proximity to the proposed Project footprint. From a desktop scan it can be seen that these other renewable energy project sites have also been affected by mining and other anthropogenic activities. Nonetheless, cumulative impacts may be caused by these various developments, including loss of biodiversity and habitat fragmentation, visual and landscape character impacts, noise, reduction in air quality, traffic disruptions, as well as pressures on local facilities, goods and services. The aforementioned impacts in relation to the Project were assessed individually in the Environmental Impact Assessment Report and mitigation measures were developed for each of the impact areas.

Other aspects considered in terms of cumulative impacts included:

- The sensitivity of the Project area from an avifaunal perspective;
- Traffic-related impacts in terms of the local road network;
- The cumulative area of indigenous vegetation to be cleared;
- The clearance of vegetative cover for the Project’s development footprint will exacerbate erosion, which is already encountered in the greater area as a result of other land use disturbances;
- Increase in the dust levels during the construction phase;
- Other developments that may be enabled by the proposed Project may place a strain on the infrastructure of Odendaalsrus;
- Problems associated with the influx of employment seekers; and

- Positive cumulative economic effects from the construction of multiple developments in the area.

I. ANALYSIS OF ALTERNATIVES

There were two alternatives that were ultimately assessed to identify the preferred options, namely Layout Alternatives A and B, as well as the Phase 1 Battery Energy Storage System Options 1 and 2.

Based on the recommendations of the specialists, technical considerations and the comparison of the impacts, the following alternatives were identified as the Best Practicable Environmental Option:

- Layout – Layout Alternative B; and
- Phase 1 Battery Energy Storage System – Option 1.

J. PUBLIC PARTICIPATION

The Environmental Impact Assessment Report provides the details of the following tasks undertaken as part of the public participation process:

- Maintaining the database of Interested and Affected Parties;
- Notification of review of the Draft Environmental Impact Assessment Report;
- Means of accessing the Draft Environmental Impact Assessment Report;
- Supplying of copies of the Draft Environmental Impact Assessment Report to Authorities;
- Scheduling authorities and public meetings to present the Draft Environmental Impact Assessment Report; and
- Commenting on the Draft Basic Assessment Report.

K. CONCLUSIONS

The following key tasks were undertaken during the Environmental Impact Assessment phase for the proposed Project:

- The specialist studies identified in the Plan of Study were undertaken and the findings were incorporated into the Environmental Impact Assessment Report in terms of understanding the environmental status quo and sensitive features, assessing the potential impacts and establishing concomitant mitigation measures, as well as identifying the preferred alternatives;
- Potentially significant impacts pertaining to the pre-construction, construction and operational phases of the Project were identified and assessed, and mitigation measures were provided; and
- Alternatives for achieving the objectives of the proposed activity were considered, and the best practicable environmental option was identified. The “no-go” option is not supported when considering the implications of not implementing the Project.

Attention is drawn to specific sensitive environmental features for which mitigation measures are included in the Environmental Impact Assessment Report and Environmental Management Programme.

An Environmental Impact Statement is also provided, which includes highlighting key findings from the Environmental Impact Assessment, which may also influence the conditions of the Environmental Authorisation (if granted).

With the selection of the Best Practicable Environmental Option, the adoption of the mitigation measures included in the Environmental Impact Report and the dedicated implementation of the Environmental Management Programme, it is believed that the significant environmental aspects and impacts associated with this Project can be suitably mitigated. With the aforementioned in mind, it can be concluded that there are no fatal flaws associated with the Project and that authorisation can be issued, based on the findings of the specialists and the impact assessment, through the compliance with the identified environmental management provisions.

AMENDMENTS PAGE

Date	Nature of Amendment	Amendment No.	Signature
August 2021	Draft for Review by Authorities and the Public	0	

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

LIST OF ACRONYMS & ABBREVIATIONS

AC	Alternating Current
ADU	Animal Demography Unit
AEL	Atmospheric Emission Licence
AIDS	Acquired Immunodeficiency Syndrome
ASAPA	Association for Southern African Professional Archaeologists
BESS	Battery Energy Storage System
BPEO	Best Practicable Environmental Option
CAR	Coordinated Avifaunal Roadcount
CBAs	Critical Biodiversity Areas
CMA	Catchment Management Agency
CPV	Concentrated Photovoltaics
CR	Critically Endangered (CR), (EN), (VU) or (LC),
CRR	Comments and Responses Report
DAFF	Department of Agriculture, Forestry and Fisheries
DC	Direct Current
DEA	Department of Environmental Affairs
DEA&DP	Department of Environmental Affairs and Development Planning
DEAT	Department of Environmental Affairs and Tourism
DEFF	Department of Environment, Forestry and Fisheries
DEL	Department of Employment and Labour
DESTEA	Department of Economic, Small Business Development, Tourism and Environmental Affairs
DFFE	Department of Forestry, Fisheries and the Environment
DC	Direct Current
DMRE	Department of Mineral Resources and Energy
DPRT	Department of Police, Roads and Transport
DWS	Department of Water and Sanitation
EAP	Environmental Assessment Practitioner
EEPP	Emergency Economic Priority Project
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
EHS	Environmental, Health, and Safety
EMPr	Environmental Management Programme
EMF	Electromagnetic Field
EMS	Environmental Management System
EN	Endangered
ESAs	Ecological Support Areas
EWT	Endangered Wildlife Trust
e-WULAAS	Electronic Water Use Licence Application and Authorisation System
FSHRA	Free State Heritage Resources Authority
GHG	Greenhouse Gas
GIS	Geographical Information System
GPS	Global Positioning Systems
GN	Government Notice

GTAC	Government Technical Advisory Centre
HGM	Hydromorphic
HIV	Human Immunodeficiency Virus
HV	High Voltage
IAPs	Interested and Affected Parties
IBAs	Important Bird & Biodiversity Areas
IDP	Integrated Development Plan
IFC	International Finance Corporation
IPP	Independent Power Producer
IRP	Integrated Resource Plan
IUCN	International Union for Conservation of Nature
KZN	KwaZulu-Natal
LC	Least Concerned
LDM	Lejweleputswa District Municipality
MLM	Matjhabeng Local Municipality
MPDRA	Mineral and Petroleum Resources Development Act (Act No. 28 of 2002)
Na	Sodium
NaS	Sodium-Sulphur
NBA	National Biodiversity Assessment
NEMA	National Environmental Management Act (No. 107 of 1998)
NEM:AQA	National Environmental Management: Air Quality Act (Act No. 39 of 2004)
NEM:BA	National Environmental Management: Biodiversity Act (Act 10 of 2004)
NEM:WA	National Environmental Management: Waste Act (Act No. 59 of 2008)
NFA	National Forests Act (Act No.84 of 1998)
NFEPA	National Freshwater Ecosystem Priority Areas
NHRA	National Heritage Resources Act (Act No. 25 of 1999)
NNR	National Nuclear Regulator
NWA	National Water Act (Act No. 36 of 1998)
NWCS	National Wetland Classification Systems
OHS	Occupational Health and Safety
PES	Present Ecological Status
PPA	Power Purchase Agreement
PPE	Personal Protective Equipment
PPP	Public Participation Plan
PS	Performance Standards
PV	Photovoltaic
REDZ	Renewable Energy Development Zones
REEA	Renewable Energy EIA Application
REIPPPP	Renewable Energy Independent Power Producer Procurement Programme
S	Sulphur
S&EIR	Scoping and Environmental Impact Reporting
SA	South Africa
SABAP2	South African Bird Atlas Project, Version 2
SACAA	South African Civil Aviation Authority
SACNASP	South African Council for Natural Scientific Professions
SAHRA	South African Heritage Resources Agency

SAHRIS	South African Heritage Resources Information System
SAIIAE	South African Inventory of Inland Aquatic Ecosystems
SANBI	South African National Biodiversity Institute
SANRAL	South African National Roads Agency SOC Ltd
SANS	South African National Standard
SAS	Scientific Aquatic Services
SCC	Species of Conservation Concern
SDF	Spatial Development Framework
SEA	Strategic Environmental Assessment
SIPs	Strategic Integrated Projects
SMME	Small, Medium and Micro-sized Enterprises
SOC	State Owned Company
SQR	Sub-Quaternary Reaches
TBC	The Biodiversity Company
VAC	Visual Absorption Capacity
VFB	Vanadium Flow Battery
VRB	Vanadium Redox Battery
VU	Vulnerable
WMA	Water Management Area

UNITS OF MEASUREMENT

Bq/g	Becquerels per gram
°C	Degrees Celsius
ha	Hectare
km	Kilometre
km^2	Square kilometre
km/h	Kilometres per hour
kV	Kilovolt
kVA	Kilovolt-ampere
m	Metre
m^2	Square metre
m^3	Cubic metre
m/s	Metre per Second
mm	Millimetre
MVA	Megavolt ampere
MW	Megawatt
MWh	Megawatt hour
TWh	Terawatt Hours
%	Percentage

1 PURPOSE OF THIS DOCUMENT

Nemai Consulting was appointed by SunElex (the Applicant / Proponent) to conduct the Environmental Impact Assessment (EIA) for the proposed development of the Matjhabeng 400 MW Solar Photovoltaic (PV) Plant with 80 MW (320 MWh) Battery Energy Storage System (BESS) (hereinafter the 'Project'), which is located north and south of the town of Odendaalsrus in the Free State Province. The EIA process is being undertaken in terms of Government Notice (GN) No. R. 982 of 4 December 2014 (as amended).

The proposed utility-scale Solar PV Plant will be developed in the following two (2) phases:

- Phase 1: 200 MW PV with 40 MW (160 MWh) BESS on the Project site located south of Odendaalsrus (hereinafter referred to as '**Phase 1 Site**'); and
- Phase 2: 200 MW PV with 40 MW (160 MWh) BESS on the Project site located north of Odendaalsrus (hereinafter referred to as '**Phase 2 Site**').

The electricity generated by the Project will be injected into the existing Eskom 132 kV distribution system as follows:

- Phase 1:
  - Proposed new 132kV power lines between the on-site substation and the existing Eskom Euclid Substation located to the south-east of the Phase 1 Site.
- Phase 2:
  - Northern and western blocks – proposed new 132kV power lines between the on-site substations and the existing Eskom Grootkop Substation located to the north of the Phase 2 Site; and
  - South-eastern block – proposed new 132kV power line between the on-site substation and the existing Eskom Geduld Substation located to the south-east of the Phase 2 Site.

This document serves as the **Draft EIA Report** for the proposed Project: **Phase 1 and Phase 2 Sites with BESS**. A separate EIA is being undertaken for the proposed power lines.

To date, the Scoping phase of the overall environmental assessment for the Project has been completed. The Final Scoping Report and Plan of Study for the EIA were approved by the former Department of Environment, Forestry and Fisheries (DEFF), which is now known as the Department of Forestry, Fisheries and the Environment (DFFE), on 5 October 2020. The Application subsequently lapsed as the Project was placed on hold. The EIA process was resumed in terms Regulation 21(2)(b) of GN No. R. 982 of 4 December 2014 (as amended).

According to GN No. R. 982 of 4 December 2014 (as amended), the objectives of the EIA process are to undertake the following, through a consultative process:

- Determine the policy and legislative context within which the activity is located and document how the proposed activity complies with and responds to the policy and legislative context;

- Describe the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the development footprint on the approved site as contemplated in the accepted Scoping Report;
- Identify the location of the development footprint within the approved site as contemplated in the accepted Scoping Report based on an impact and risk assessment process inclusive of cumulative impacts and a ranking process of all the identified development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects of the environment;
- Determine the -
  - Nature, significance, consequence, extent, duration and probability of the impacts occurring to inform identified preferred alternatives; and
  - Degree to which these impacts -
    - Can be reversed;
    - May cause irreplaceable loss of resources; and
    - Can be avoided, managed or mitigated;
- Identify the most ideal location for the activity within the development footprint of the approved site as contemplated in the accepted Scoping Report based on the lowest level of environmental sensitivity identified during the assessment;
- Identify, assess, and rank the impacts the activity will impose on the development footprint on the approved site as contemplated in the accepted scoping report through the life of the activity;
- Identify suitable measures to avoid, manage or mitigate identified impacts; and
- Identify residual risks that need to be managed and monitored.

The Draft EIA Report will be made available to Interested and Affected Parties (IAPs) for a 30-day review period from **16 August until** 1**6 September 2021**. All comments that are received will be addressed in the Final EIA Report and will also be included in the Comments and Responses Report. The Final EIA Report will then be submitted to the DFFE for review and decision-making.

2 DOCUMENT ROADMAP

As a minimum, the EIA Report aims to satisfy the requirements stipulated in Appendix 3 of GN No. R 982 of 4 December 2014 (as amended). **Table 1** presents the document's composition in terms of the aforementioned regulatory requirements.

Table 1: EIA Report Roadmap

Chapter	Title	Correlation with GN No. R. 982	GN No. R. 982 Description
1	Purpose of this Document	–	–
2	Document Roadmap	–	–
3	Project Background and Motivation	–	–
4	Project Location	3(1)(b)	The location of the development footprint of the activity on the approved site as contemplated in the accepted Scoping Report, including: (i) the 21 digit Surveyor General code of each cadastral land parcel; (ii) where available, the physical address and farm name; and (iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties.
		3(1)(c)	A plan which locates the proposed activity or activities applied for as well as the associated structures and infrastructure at an appropriate scale, or, if it is - (i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; and (ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken.
5	Legislation and Guidelines Considered	3(1)(e)	A description of the policy and legislative context within which the development is located and an explanation of how the proposed development complies with and responds to the legislation and policy context.
6	Scoping and EIA Process	3(1)(a)	Details of- (i) the EAP who prepared the report; and (ii) the expertise of the EAP, including a curriculum vitae.
		3(1)(u)	An indication of any deviation from the approved scoping report, including the plan of study, including- (i) any deviation from the methodology used in determining the significance of potential environmental impacts and risks; and (ii) a motivation for the deviation.
		3(1)(v)	Any specific information that may be required by the competent authority.
7	Assumptions and Limitations	3(1)(p)	A description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed.

Chapter	Title	Correlation with GN No. R. 982	GN No. R. 982 Description
8	Need and Desirability	3(1)(f)	A motivation for the need and desirability for the proposed development, including the need and desirability of the activity in the context of the preferred development footprint within the approved site as contemplated in the accepted Scoping Report.
9	Project Description	3(1)(d)	A description of the scope of the proposed activity, including- (i) all listed and specified activities triggered and being applied for; and (ii) a description of the associated structures and infrastructure related to the development.
		3(1)(g)	A motivation for the preferred development footprint within the approved site as contemplated in the accepted scoping report.
		3(1)(h)(i)	A full description of the process followed to reach the proposed development footprint within the approved site as contemplated in the accepted scoping report, including: (i) details of the development footprint alternatives considered.
		3(1)(h)(ix)	If no alternative development footprints for the activity were investigated, the motivation for not considering such.
		3(1)(t)	Where applicable, details of any financial provisions for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts.
10	Alternatives	3(1)(h)(i)	Details of the development footprint alternatives considered.
11	Profile of the Receiving Environment	3(1)(h)(iv)	The environmental attributes associated with the development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects.
12	Summary of Specialist Studies	3(1)(k)	Where applicable, a summary of the findings and recommendations of any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final assessment report.
13	Impact Assessment	3(1)(h)(v)	The impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts- (i) can be reversed; (ii) may cause irreplaceable loss of resources; and (iii) can be avoided, managed or mitigated.
		3(1)(h)(vi)	The methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks.
		3(1)(h)(vii)	Positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects.
		3(1)(h)(viii)	The possible mitigation measures that could be applied and level of residual risk.

Chapter	Title	Correlation with GN No. R. 982	GN No. R. 982 Description
		3(1)(i)	A full description of the process undertaken to identify, assess and rank the impacts the activity and associated structures and infrastructure will impose on the preferred development footprint on the approved site as contemplated in the accepted scoping report through the life of the activity, including - (i) a description of all environmental issues and risks that were identified during the environmental impact assessment process; and (ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures.
		3(1)(j)	An assessment of each identified potentially significant impact and risk, including- (i) cumulative impacts; (ii) the nature, significance and consequences of the impact and risk; (iii) the extent and duration of the impact and risk; (iv) the probability of the impact and risk occurring; (v) the degree to which the impact and risk can be reversed; (vi) the degree to which the impact and risk may cause irreplaceable loss of resources; and (vii) the degree to which the impact and risk can be mitigated.
		3(1)(m)	Based on the assessment, and where applicable, recommendations from specialist reports, the recording of proposed impact management outcomes for the development for inclusion in the Environmental Management Programme (EMPr) as well as for inclusion as conditions of authorisation.
14	Analysis of Alternatives	3(1)(h)(ix)	If no alternative development locations for the activity were investigated, the motivation for not considering such.
		3(1)(h)(x)	A concluding statement indicating the location of the preferred alternative development footprint within the approved site as contemplated in the accepted Scoping Report.
		3(1)(n)	The final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment.
15	Public Participation – EIA Phase	3(1)(h)(ii)	Details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs.
16	EIA Conclusions	3(1)(l)	An environmental impact statement which contains- (i) a summary of the key findings of the environmental impact assessment; (ii) a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred development footprint on the approved site as contemplated in the accepted scoping report

Chapter	Title	Correlation with GN No. R. 982	GN No. R. 982 Description
			indicating any areas that should be avoided, including buffers; and (iii) a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives.
		3(1)(o)	Any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation.
		3(1)(q)	A reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation.
17	References	-	-
Appendix A	Locality Maps	3(1)(c)	A plan which locates the proposed activity or activities applied for as well as the associated structures and infrastructure at an appropriate scale.
Appendix H	Specialists' Reports	R23(5)	Specialist Reports containing all information set out in Appendix 6 of GN No. R. 982 of 4 December 2014 (as amended).
Appendix K	EMPr	R23(4)	Environmental Management Programme containing all information set out in Appendix 4 of GN No. R. 982 of 4 December 2014 (as amended).
Appendix J	Comments and Responses Report	3(1)(h)(ii)	Details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs.
		3(1)(h)(iii)	A summary of the issues raised by Interested and Affected Parties (IAPs), and an indication of the manner in which the issues were incorporated, or the reasons for not including them.
Appendix L	Oath of Environmental Assessment Practitioner	3(1)(s)	An undertaking under oath or affirmation by the EAP in relation to: (i) the correctness of the information provided in the reports; (ii) the inclusion of comments and inputs from stakeholders and IAPs; (iii) the inclusion of inputs and recommendations from the specialist reports where relevant; and (iv) any information provided by the EAP to IAPs and any responses by the EAP to comments or inputs made by IAPs.
N/A		3(1)(r)	Where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required and the date on which the activity will be concluded and the post construction monitoring requirements finalised**.**
N/A		3(1)(w)	Any other matters required in terms of section 24(4)(a) and (b) of the Act.

3 PROJECT BACKGROUND AND MOTIVATION

The South African Government ratified the Paris Agreement in 2016, and thereby showed the country's commitment to contribute to the global effort to address the challenge of climate change.

Electricity generation sources need to be diversified to ensure security of supply and reduction in the carbon footprint created by the current heavy reliance of South Africa (SA) on coal to produce electricity. The electricity demand is increasing in SA, and in order to match that demand there is a need to supply a diversified power generation that includes renewable energy technologies. These technologies include solar, wind, small utility scale hydro, biomass, biogas and energy storage that the Department of Mineral Resources and Energy (DMRE) intends to develop and implement as identified in the approved Integrated Resource Plan (IRP) 2019.

Since the adoption of the Constitution, international and government policy papers have created the foundation for SA's energy programme. The need to expand and increase electricity generation capacity in the country is based on national policy and informed by on-going strategic planning undertaken by the DMRE. The hierarchy of policy and planning documentation that support the development of renewable energy projects such as the proposed Project is illustrated in **Figure 1** below.

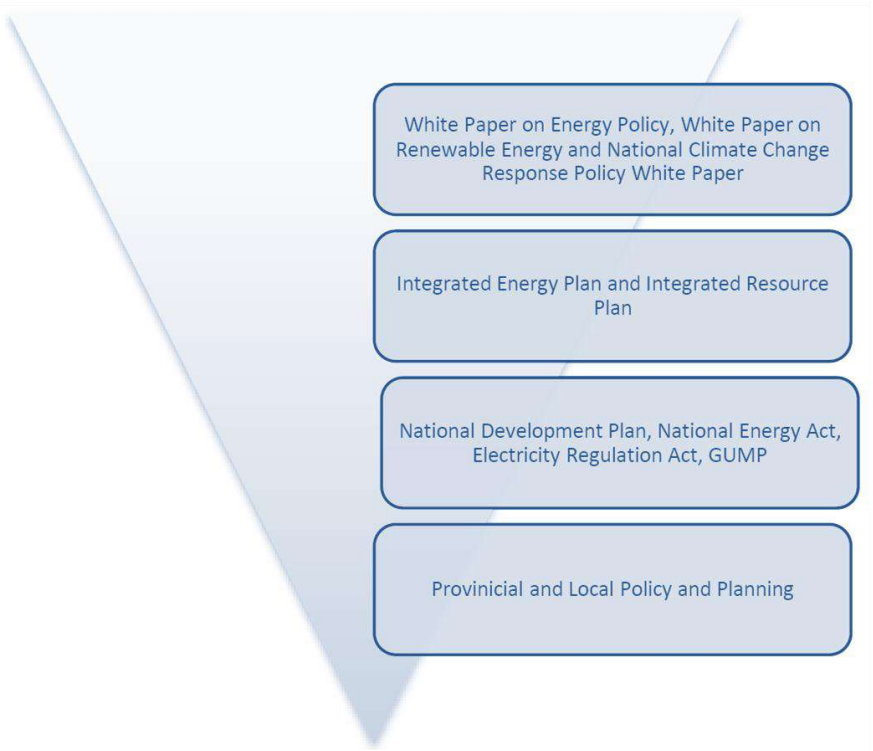


Figure 1: Hierarchy of electricity policy and planning documents

The Matjhabeng Local Municipality (MLM) recognizes the need to meet the energy requirements of its residents in a dynamic changing sector. In response to this need, SunElex Energy (Pty) Ltd (hereinafter referred to as "SunElex") has proposed the development of the Matjhabeng 400MW

Solar PV with Battery Energy Storage Systems (BESS) Power Plant (hereinafter referred to as the "Project"). The Project will thus be developed to serve the MLM's energy requirements and will generate power for delivery to the local/national grid. Surplus power will be taken up by other Commercial and Industrial (C&I) off-takers via additional Private Power Purchase Agreements (PPA's). Therefore, the MLM's Council has formally classified this Project as an "Emergency Economic Priority Project" (EEPP).

The Project will thus benefit the MLM as follows:

- Savings on the current and already substantial Eskom Bill as the Project's tariff is lower than the Eskom tariff and the escalation rate is fixed per year at its applicable CPI rates during the life-cycle of the Project;
- Potential to attract foreign investments and subsequently achieve economic growth;
- Additional revenue stream due to the innovational technology, which has the potential to enable the selling of excess power to Eskom or another off-taker;
- Refinancing the current Eskom debt for immediate relief;
- Financial investment into the municipality jurisdiction that will boost the economic cycle of the community;
- New upcoming industrialization activity attraction;
- Job creation, skills development and Small Medium Micro Enterprises (SMME) development; and
- Transforming the energy sector in SA and Africa as per its current timeline. The Project will be the first to rollout utility scale BESS at the capacity quoted within the next 24 months due to imminent delays and risks of Eskom's pilot BESS programme.

The proposed Project will have a project design life of 25 years. The clean energy from the Solar Park will be integrated and connected to the Eskom national grid which will be done in conjunction with Eskom, SA's State Owned Company (SOC), which is the national electricity supplier.

The South African Government adopted a National Infrastructure Plan in 2012 that intends to transform our economic landscape while simultaneously creating significant numbers of new jobs, and to strengthen the delivery of basic services. The plan also supports the integration of African economies. The National Infrastructure Plan consists of 18 Strategic Integrated Projects (SIPs), of which SIP 8 targets the development of green energy in support of SA's economy. This Project supports SIP 8 and aims to address the MLM's urgent need for electricity.

The surface rights, where the Project will be established, belong to the MLM and SunElex has secured a long term lease with the MLM for the duration of the Power Purchase Agreement (PPA). To this end, the Project is registered as a Public Private Partnership (PPP) with the Government Technical Advisory Centre (GTAC), an agency of the National Treasury.

The Feasibility Studies ,which were finalised in 2016, confirmed the techno-economic feasibility of the Project, as well as its significant potential for positive socio-economic impact in the MLM.

4 PROJECT LOCATION

4.1 Location of the Project relative to Solar Yield Area

The rationale for the Project is based on its geographic location and the value it provides to the MLM and its users of electricity/energy. The Project is to be located in a high solar yield area, with irradiation levels capable of producing over 1TWh (equal to one million MWhs) of renewable energy annually, with a nominal net generating capacity of 400 MWn, based solely on PV technology (refer to **Figure 2** below).

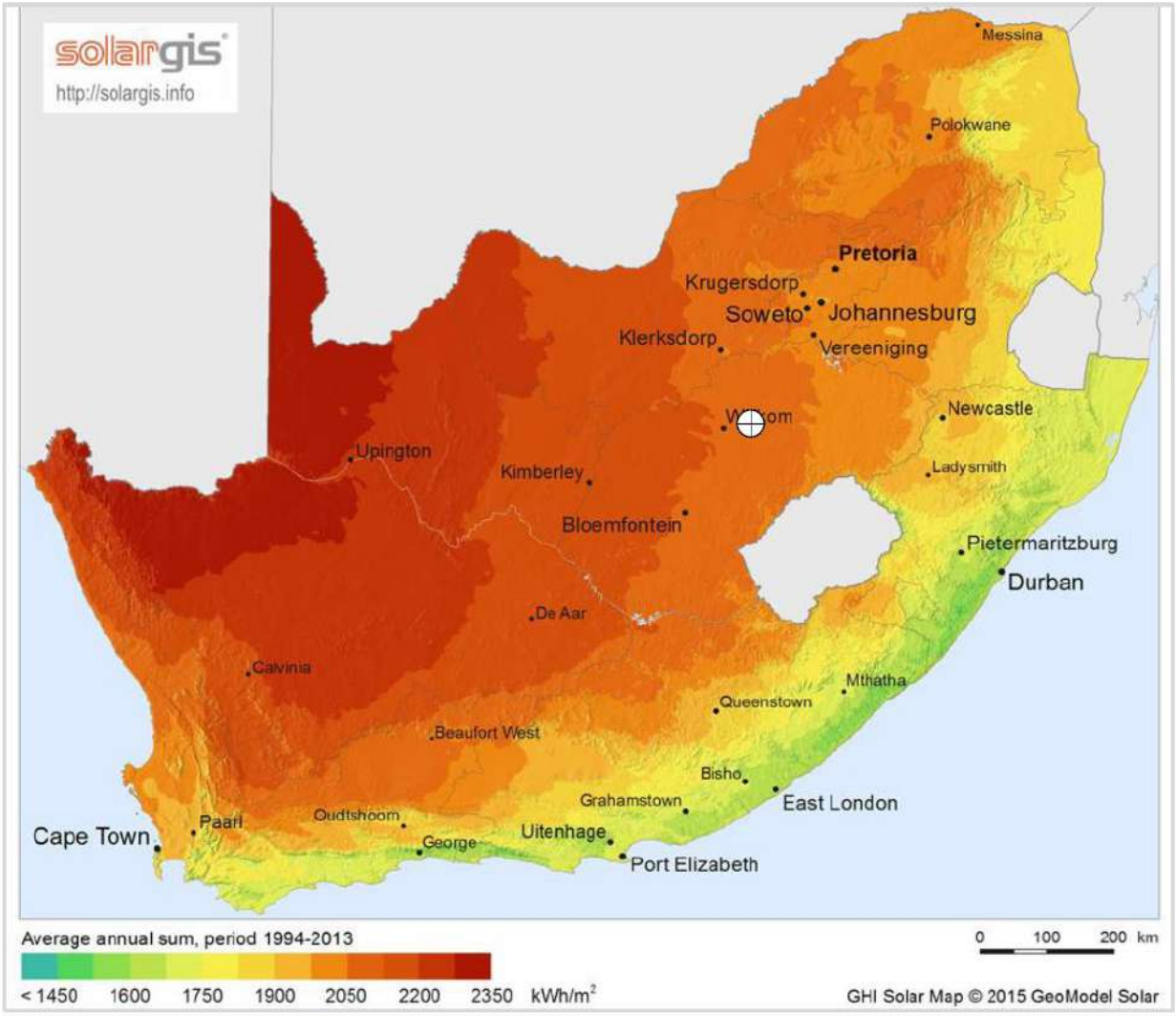


Figure 2: Location of the Project relative to Solar Yield Area
(denoted by the black cross on white background)

4.2 Geographical Context

The Project is located in the north-western part of the Free State Province and falls within the MLM and Lejweleputswa District Municipality (LDM). The locality map is depicted in **Figure 3** below and

aerial views of the Phase 1 and Phase 2 Sites are shown in **Figure 4** and **Figure 5** below, respectively. Additional maps are also contained in **Appendix A**.

The topography is relatively flat which makes it suitable for large scale solar project development. The Project is located in close proximity to all required infrastructure. Specifically, the power infrastructure is excellent and according to a Network Integration Study that was undertaken the two (2) Eskom substations, namely, Euclid and GrootKop, have the potential to enable the evacuation of 900 MW of new electricity generation. The connection to Eskom infrastructure will be uncomplicated, with new 132 kV power lines running from the sites, via existing and/or new associated infrastructure servitudes, to the two (2) Eskom Distribution Stations. A separate EIA is being undertaken for the Project's proposed power lines.

The Project is located within proximity to the town of Odendaalsrus where municipal services (water and sewage connections) are available. The sites are easily accessible from the north and south by the R30 arterial road (traversing both sites) and from the east and west via the R34 arterial road. An operational railway line runs to the immediate west of the Project's Phase 1 Site and traverses the Phase 2 Site.

The details of the Project's Phase 1 and Phase 2 Sites are provided in **Table 2** below. Details of the properties that are directly affected by and adjacent to the proposed development are contained in **Appendix B**, and coordinates for the project components are listed in **Appendix C**. It is noted that the Phase 1 and Phase 2 Sites that were presented in the Scoping Report were based on cadastral boundaries. The layouts were refined with the progression of the technical design of the Project, as reflected in this EIA Report.

Table 2: Details of the Project's Phase 1 and Phase 2 Sites

Farm Details	21-digit Surveyor General No.	MLM Ward	Approximate centre point coordinates	Geographical land area (site extent) *
PHASE 1 SITE				
Portion 2 of the Farm Kalkkuil 153	F02400000000015300002	35	27°53'58.52"S; 26°41'45.46"E	Approximately 650 Ha
Portion 0 of the Farm Hesters-Rust 224	F02400000000022400000			
PHASE 2 SITE				
Portion 0 of the Farm Dolly 404	F02400000000040400000	36	27°51'00.28"S; 26°41'05.72"E	Approximately 610 Ha (western block = ± 193 Ha; northern block = ± 232 Ha; south-eastern block = ± 184 Ha)
Portion 0 of the Farm Ophir 405	F02400000000040500000			
Remaining Extent of the Farm Paleis-Heuvel 323	F02400000000032300000			
Portion 3 of the Farm Paleis-Heuvel 323	F02400000000032300003			
Portion 2 of the Farm Kalkkuil 153	F02400000000015300002			

** Based on the area enclosed by the fence*

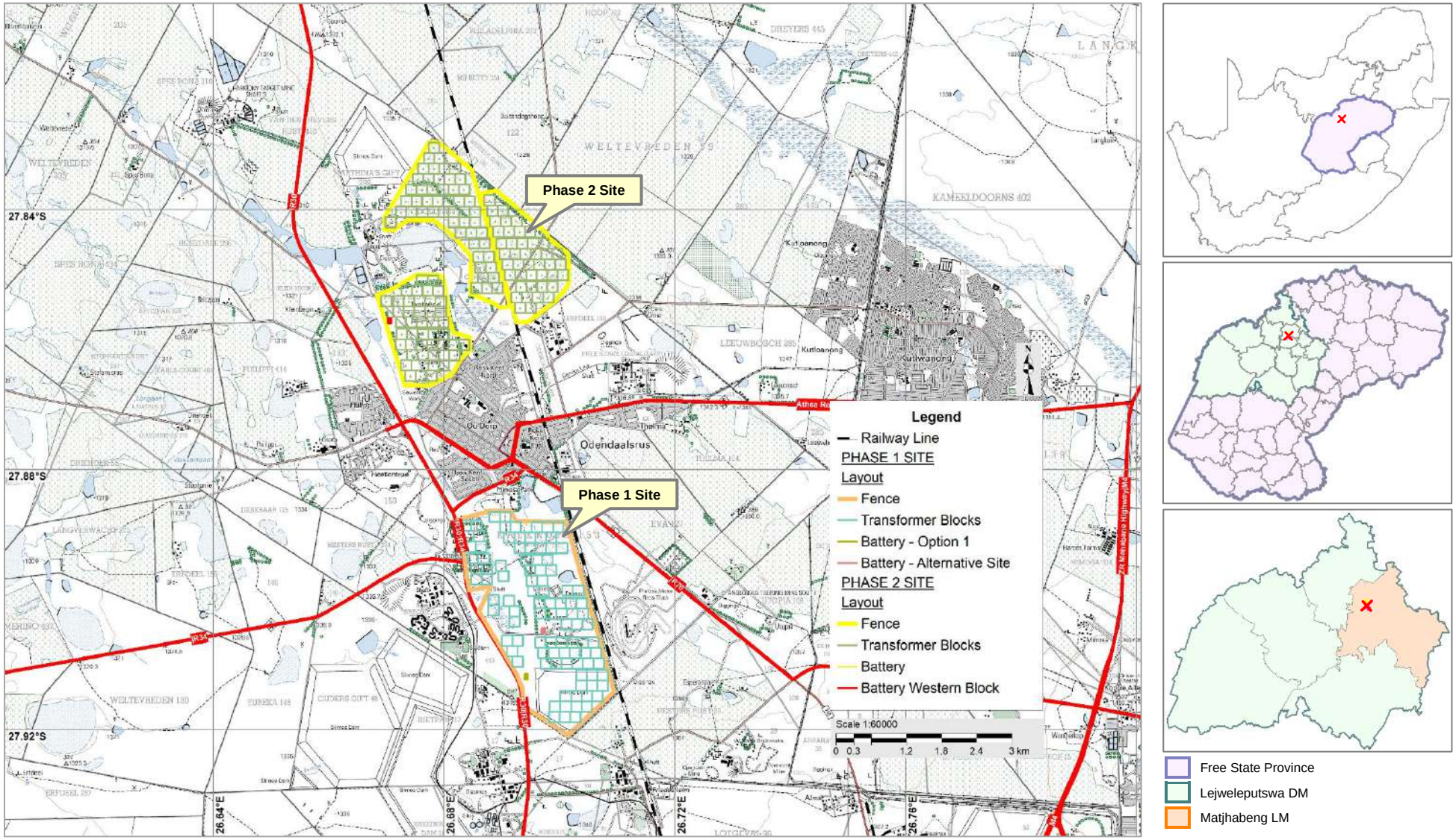


Figure 3: **Locality map of the Project's Phase 1 and Phase 2 Sites**

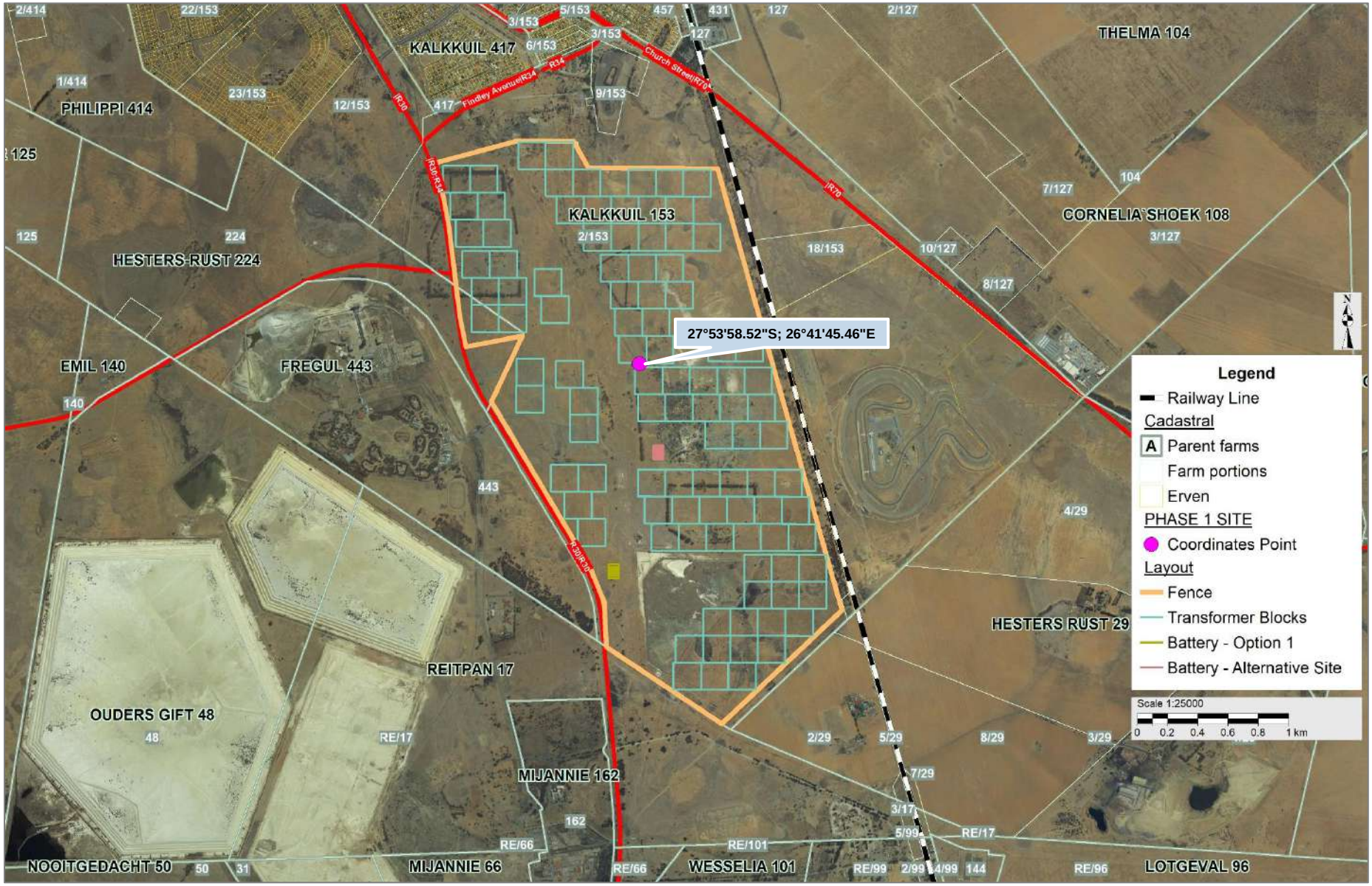


Figure 4: Orthophotograph of the Project's Phase 1 Site

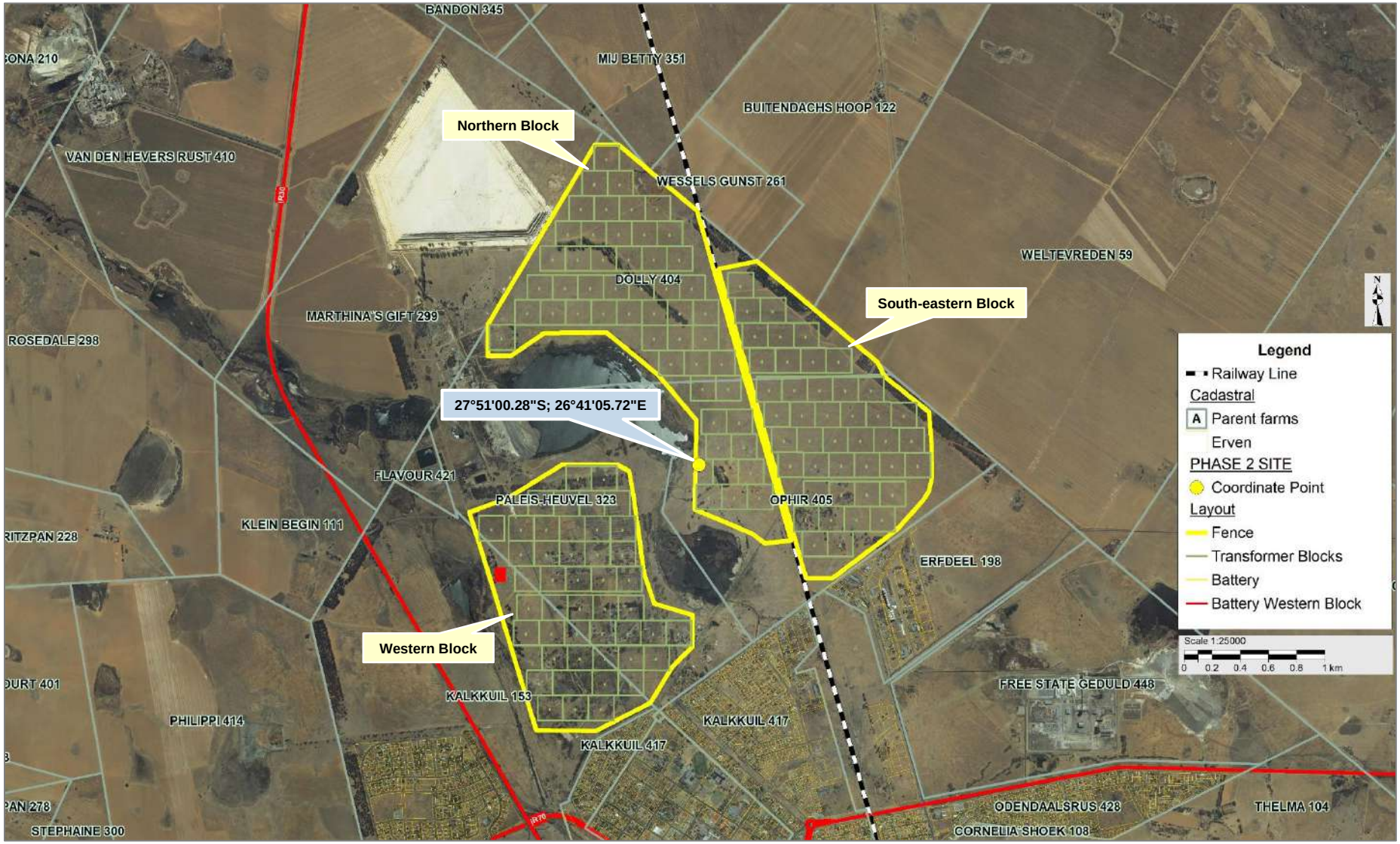


Figure 5: **Orthophotograph of the Project's Phase 2 Site**

5 LEGISLATION AND GUIDELINES CONSIDERED

5.1 International Finance Corporation - Performance Standards & Guidelines

Where relevant, the Project would strive to satisfy and incorporate the International Finance Corporation (IFC) Performance Standards (PS), which serve as an international benchmark for identifying and managing environmental and social risks.

The IFC PS offer a framework for understanding and managing environmental and social risks for high profile, complex, international and potentially high impact projects. The IFC PS encompass the following eight topics:

- Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts;
- Performance Standard 2: Labour and Working Conditions;
- Performance Standard 3: Resource Efficiency and Pollution Prevention;
- Performance Standard 4: Community Health, Safety, and Security;
- Performance Standard 5: Land Acquisition and Involuntary Resettlement;
- Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources;
- Performance Standard 7: Indigenous Peoples; and
- Performance Standard 8: Cultural Heritage.

IFC's Environmental, Health, and Safety (EHS) Guidelines provide technical guidelines with general and industry-specific examples of good international industry practice to meet IFC PS.

5.2 Legislation

5.2.1 Environmental Statutory Framework

The legislation that has possible bearing on the proposed Project from an environmental perspective is captured in **Table 3** below. **Note:** *this list does not attempt to provide an exhaustive explanation, but rather represents an identification of some of the most appropriate sections from pertinent pieces of legislation*.

Table 3: Environmental Statutory Framework

Legislation	Description and Relevance
Constitution of the Republic of South Africa, (No. 108 of 1996)	▪ Chapter 2 – Bill of Rights. ▪ Section 24 – Environmental Rights.
National Environmental Management Act	▪ Key sections (amongst others): o Section 24 – Environmental Authorisation (control of activities which may have a detrimental effect on the environment).

Legislation	Description and Relevance	
(NEMA) (No. 107 of 1998)	o Section 28 – Duty of care and remediation of environmental damage. ▪ Environmental management principles. ▪ Authorities – DFFE (national) and the Free State Department of Economic, Small Business Development, Tourism and Environmental Affairs (DESTEA) (provincial).	
GN No. R 982 of 4 December 2014 (as amended)	▪ Purpose - regulate the procedure and criteria as contemplated in Chapter 5 of NEMA relating to the preparation, evaluation, submission, processing and consideration of, and decision on, applications for environmental authorisations for the commencement of activities, subjected to EIA, in order to avoid or mitigate detrimental impacts on the environment, and to optimise positive environmental impacts, and for matters pertaining thereto.	
GN No. R. 983 of 4 December 2014 (as amended) (Listing Notice 1)	▪ Purpose - identify activities that would require environmental authorisations prior to commencement of that activity and to identify competent authorities in terms of sections 24(2) and 24D of NEMA. ▪ The investigation, assessment and communication of potential impact of activities must follow a Basic Assessment process, as prescribed in regulations 19 and 20 of GN No. R 982 of 4 December 2014 (as amended). However, according to Regulation 15(3) of GN No. R 982 (as amended), S&EIR must be applied to an application if the application is for two or more activities as part of the same development for which S&EIR must already be applied in respect of any of the activities. ▪ Activities under Listing Notice 1 that are relevant to this project follow.	
	GN No. R.983 – Activity no. 9(i) & (ii): The development of infrastructure exceeding 1000 metres in length for the bulk transportation of water or storm water- (i) with an internal diameter of 0,36 metres or more; or (ii) with a peak throughput of 120 litres per second or more; excluding where- (a) such infrastructure is for bulk transportation of water or storm water or storm water drainage inside a road reserve; or (b) where such development will occur within an urban area.	*Storm water measures and management will be necessary as part of the terrain layout and planning.* *Water distribution over terrain to certain points for use in cleaning panels.*
	GN No. R.983 – Activity no. 12(ii)(a - c): The development of - (i) dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100 square metres; or (ii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs - (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse; - excluding - (aa) the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour; (bb) where such development activities are related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies; (cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 14 in Listing Notice 3 of 2014, in which case that activity applies; (dd) where such development occurs within an urban area; (ee) where such development occurs within existing roads, road reserves or railway line reserves; or	*Infrastructure associated with the development with a physical footprint of 100 square metres or more within watercourse(s) / within 32 m from watercourse(s).*

Legislation	Description and Relevance	
	(ff) the development of temporary infrastructure or structures where such infrastructure or structures will be removed within 6 weeks of the commencement of development and where indigenous vegetation will not be cleared.	
	GN No. R.983 – Activity no. 14: *The development of facilities or infrastructure, for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 cubic metres or more but not exceeding 500 cubic metres.*	*The proposed BESS will not consist of an electrolyte (varying from zinc-bromide, vanadium) but is of Li-Ion technology of which Lithium is considered hazardous.*
	GN No. R.983 – Activity no. 19: *The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse;* *but excluding where such infilling, depositing, dredging, excavation, removal or moving -* *(a) will occur behind a development setback;* *(b) is for maintenance purposes undertaken in accordance with a maintenance management plan;* *(c) falls within the ambit of activity 21 in this Notice, in which case that activity applies;* *(d) occurs within existing ports or harbours that will not increase the development footprint of the port or harbour; or* *(e) where such development is related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies.*	*Infrastructure associated with the development within watercourse(s).*
	GN No. R.983 – Activity no. 24(ii): The development of a road - (i) for which an environmental authorisation was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Government Notice 545 of 2010; or (ii) <u>with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres</u>; but excluding a road - (a) which is identified and included in activity 27 in Listing Notice 2 of 2014; (b) where the entire road falls within an urban area; or (c) which is 1 kilometre or shorter.	*Access roads to and within the Phase 1 and Phase 2 Sites (construction and operational phases).* *With regard to the roads, the internal roads will vary from 4m to 7m wide and will be gravel. The entrance road will exceed 7m, most likely 7.4m wide.* *A road on Phase 2 will be realigned, this is a tarred road and becomes gravel. The width of the tarred section will exceed 7m and gravel section including shoulders 11m.*
	GN No. R.983 – Activity no. 26: *Residential, retail, recreational, tourism, commercial or institutional developments of 1 000 square metres or more, on land previously used for mining or heavy industrial purposes; -* *excluding -* *(i) where such land has been remediated in terms of part 8 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the National Environmental Management: Waste Act, 2008 applies; or* *(ii) where an environmental authorisation has been obtained for the decommissioning of such a mine or industry in terms of this Notice or any previous NEMA notice; or*	*The facility will be located on land previously used for mining, although the Project is an energy infrastructure development.* *Although there is an existing mining right by Harmony Gold Mining Company Ltd on the area in question, a consent letter was received from the mining company. There is also a Tripartite and Rehabilitation Agreement between Harmony Gold Mining Company Ltd, MLM and the Applicant related to the rehabilitation obligations.*

Legislation	Description and Relevance	
	(iii) where a closure certificate has been issued in terms of section 43 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) for such land.	
	GN No. R.983 – Activity no. 27: *The clearance of an area of 1 hectares or more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous vegetation is required for-* *(i) the undertaking of a linear activity; or* *(ii) maintenance purposes undertaken in accordance with a maintenance management plan.*	*Clearance of areas consisting of indigenous vegetation associated with the construction footprint.* *Area of indigenous vegetation to be cleared includes:* ▪ *Phase 1: Approximately 358 Ha;* ▪ *Phase 2: Approximately 325 Ha.*
	GN No. R.983 – Activity no. 28(i) & (ii): Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture, game farming, equestrian purposes or afforestation on or after 01 April 1998 and where such development: (i) will occur inside an urban area, where the total land to be developed is bigger than 5 hectares; or (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare; excluding where such land has already been developed for residential, mixed, retail, commercial, industrial or institutional purposes.	*Footprint of Project on land that was previously used for agricultural purposes, prior to mining, outside of an urban area.*
	GN No. R.983 – Activity no. 45(i) & (ii): The expansion of infrastructure for the bulk transportation of water or storm water where the existing infrastructure - (i) has an internal diameter of 0,36 metres or more; or (ii) has a peak throughput of 120 litres per second or more; and (a) where the facility or infrastructure is expanded by more than 1 000 metres in length; or (b) where the throughput capacity of the facility or infrastructure will be increased by 10% or more; excluding where such expansion - (aa) relates to transportation of water or storm water within a road reserve or railway line reserve; or (bb) will occur within an urban area.	*Storm water measures and management will be necessary as part of the terrain layout and planning.* *Water distribution over terrain to certain points for use in cleaning panels.*
	GN No. R.983 – Activity no. 48(i)(a - c): The expansion of - (i) infrastructure or structures where the physical footprint is expanded by 100 square metres or more; or (ii) dams or weirs, where the dam or weir, including infrastructure and water surface area, is expanded by 100 square metres or more; where such expansion occurs - (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse; Excluding -	*Expansion of infrastructure associated with the development with a physical footprint of 100 square metres or more within watercourse(s) / within 32 m from watercourse(s).*

Legislation	Description and Relevance	
	(aa) the expansion of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour; (bb) where such expansion activities are related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies; (cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 14 in Listing Notice 3 of 2014, in which case that activity applies; (dd) where such expansion occurs within an urban area; or (ee) where such expansion occurs within existing roads, road reserves or railway line reserves.	
	GN No. R.983 – Activity no. 56(i) & (ii): The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre- (i) where the existing reserve is wider than 13,5 meters; or (ii) where no reserve exists, where the existing road is wider than 8 metres; excluding where widening or lengthening occur inside urban areas.	*Access roads to the Phase 1 and Phase 2 Sites (construction and operational phases).* *With regard to the roads, the internal roads will vary from 4m to 7m wide and will be gravel. The entrance road will exceed 7m, most likely 7.4m wide.* *A road on phase 2 will be realigned, this is a tarred road and becomes gravel. The width of the tarred section will exceed 7m and gravel section including shoulders 11m.*
GN No. R. 984 of 4 December 2014 (as amended) (Listing Notice 2)	▪ Purpose - identify activities that would require environmental authorisations prior to commencement of that activity and to identify competent authorities in terms of sections 24(2) and 24D of NEMA. ▪ The investigation, assessment and communication of potential impact of activities must follow a Scoping and EIA process, as prescribed in regulations 21 - 24 of GN No. R 982 of 4 December 2014 (as amended). ▪ Activities under Listing Notice 2 that are relevant to this project follow.	
	GN No. R.984 – Activity no. 1: *1. The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more, excluding where such development of facilities or infrastructure is for photovoltaic installations and occurs -* *(a) within an urban area; or* *(b) on existing infrastructure.*	*The planned generation capacity of the Solal PV Plant is 400 MW with 80 MW (320 MWh) BESS.*
	GN No. R.984 – Activity no. 4: *The development and related operation of facilities or infrastructure, for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of more than 500 cubic metres.*	*The proposed BESS will not consist of an electrolyte (varying from zinc-bromide, vanadium) but is of Li-Ion technology of which Lithium is considered hazardous.*
	GN No. R.984 – Activity no. 15: *The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for-* *(i) the undertaking of a linear activity; or* *(ii) maintenance purposes undertaken in accordance with a maintenance management plan.*	*Cumulative area to be cleared for entire Project (except linear components) exceeds 20 hectares.* *Area of indigenous vegetation to be cleared includes:* ▪ *Phase 1: Approximately 358 Ha;* ▪ *Phase 2: Approximately 325 Ha.*
GN No. R. 985 of 4 December 2014 (as	▪ Purpose - list activities and identify competent authorities under sections 24(2), 24(5) and 24D of NEMA, where environmental authorisation is required prior to commencement of that activity in specific identified geographical areas only.	

Legislation	Description and Relevance	
amended) (Listing Notice 3)	▪ The investigation, assessment and communication of potential impact of activities must follow a Basic Assessment process, as prescribed in regulations 19 and 20 of GN No. R 982 of 4 December 2014 (as amended). However, according to Regulation 15(3) of GN No. R 982 (as amended), S&EIR must be applied to an application if the application is for two or more activities as part of the same development for which S&EIR must already be applied in respect of any of the activities. ▪ Activities under Listing Notice 3 that are relevant to this project follow.	
	GN No. R.985 – Activity no. 4 - (b)(i)(ee): The development of a road wider than 4 metres with a reserve less than 13,5 metres. b. Free State i. Outside urban areas: (ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans.	*The internal roads will vary from 4m to 7m wide and will be gravel. The entrance road will exceed 7m, most likely 7.4m wide. Certain sections of the access roads will encroach into Critical Biodiversity Areas (CBAs).*
	GN No. R.985 – Activity no. 12 - (b)(i), (ii) & (iv): The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan. b. Free State i. Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004; ii. Within critical biodiversity areas identified in bioregional plans; iv. Areas within a watercourse or wetland; or within 100 metres from the edge of a watercourse or wetland.	*Clearance of large areas of indigenous vegetation as part of the construction footprint, including within areas consisting of endangered ecosystems, CBAs and within 100 m from the edge of a watercourse or wetland.*
	GN No. R.985 – Activity no. 14(ii)(a - c) - (b)(i)(ff): The development of— (i) dams or weirs, where the dam or weir, including infrastructure and water surface area exceeds 10 square metres; or (ii) infrastructure or structures with a physical footprint of 10 square metres or more; where such development occurs— (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse; excluding the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour. b. Free State i. Outside urban areas: (ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans.	*Various infrastructure within watercourse(s) / within 32 m from watercourse(s), within CBAs.*
	GN No. R.985 – Activity no. 18 - (b)(i)(ee) & (hh): The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre.	*Access roads to the sites (construction and operational phases), within CBAs and within 100 m from the edge of a watercourse or wetland.*

Legislation	Description and Relevance	
	b. Free State i. Outside urban areas: (ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans; (hh) Areas within a watercourse or wetland; or within 100 metres from the edge of a watercourse or wetland.	
	GN No. R.985 – Activity no. 23(ii)(a) & (c) - (b)(i)(ee): The expansion of - (i) dams or weirs where the dam or weir is expanded by 10 square metres or more; or (ii) infrastructure or structures where the physical footprint is expanded by 10 square metres or more; where such expansion occurs - (a) within a watercourse; (b) in front of a development setback adopted in the prescribed manner; or (c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse; excluding the expansion of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour. b. Free State i. Outside urban areas: (ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans.	*Upgrade of watercourse crossings along access roads, within CBAs.*
National Water Act (Act No. 36 of 1998)	▪ Sustainable and equitable management of water resources. ▪ Key sections (amongst others): o Chapter 3 – Protection of water resources. o Section 19 – Prevention and remedying effects of pollution. o Section 20 – Control of emergency incidents. o Chapter 4 – Water use. ▪ Authority – Department of Water and Sanitation (DWS).	
National Environmental Management Air Quality Act (Act No. 39 of 2004)	▪ Air quality management ▪ Key sections (amongst others): o Section 32 – Dust control. o Section 34 – Noise control. ▪ Authorisation type – Atmospheric Emission License. *Note that this is not required for the Project.* ▪ Authority – DFFE (national) and provincial counterparts as well as municipalities.	
National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)	▪ Management and conservation of the country's biodiversity. ▪ Protection of species and ecosystems. ▪ Authorisation type – Permit. ▪ Authority – DFFE and provincial counterparts.	
National Environmental Management: Protected Areas Act (Act No. 57 of 2003)	▪ Protection and conservation of ecologically viable areas representative of South Africa's biological diversity and natural landscapes.	
National Environmental Management: Waste Act (Act No. 59 of 2008)	▪ Management of waste. ▪ Chapter 5 – licensing requirements for listed waste activities - GN No. R. 921 of 29 November 2013 (as amended). ▪ Authorisation type – Waste Management Licence. *Note that this is not required for the Project.* ▪ Authority – DFFE (national) and provincial counterparts.	
National Forests Act (No. 84 of 1998)	▪ Supports sustainable forest management and the restructuring of the forestry sector, as well as protection of indigenous trees in general. ▪ Section 15 – Authorisation required for impacts to protected trees. ▪ Authorisation type – Permit. ▪ Authority – Department of Agriculture, Forestry and Fisheries (DAFF).	

Legislation	Description and Relevance
Minerals and Petroleum Resources Development Act (Act No. 28 of 2002)	▪ Equitable access to and sustainable development of the nation's mineral and petroleum resources and to provide for matters related thereto. ▪ Key sections (amongst others): o Section 22 – Application for mining right. o Section 27 – Application for, issuing and duration of mining permit. o Section 53 – Use of land surface rights contrary to objects of Act. ▪ Authorisation type – Mining Permit / Mining Right. *Note that this is not required for the Project.* ▪ Authority – Department of Mineral Resources and Energy (DMRE).
Occupational Health & Safety Act (Act No. 85 of 1993)	▪ Provisions for Occupational Health & Safety. ▪ Authority – Department of Employment and Labour (DEL). ▪ Relevant regulations, such as Electrical Installation Regulations, Construction Regulations, etc.
Hazardous Substance Act (No 15 of 1973) and Regulations	▪ Provides for the control of substances which may cause injury or ill-health to or death of human beings by reason of their toxic, corrosive, irritant, strongly sensitizing or flammable nature or the generation of pressure thereby in certain circumstances, and for the control of certain electronic products ▪ Provides for the division of such substances or products into groups in relation to the degree of danger. ▪ Provides for the prohibition and control of the importation, manufacture, sale, use, operation, application, modification, disposal or dumping of such substances and products.
National Heritage Resources Act (Act No. 25 of 1999)	▪ Key sections: o Section 34 – protection of structure older than 60 years. o Section 35 – protection of heritage resources. o Section 36 – protection of graves and burial grounds. o Section 38 – Heritage Impact Assessment for linear development exceeding 300m in length; development exceeding 5 000m^2 in extent, etc. ▪ Authorisation type – Permit. ▪ Authority – South African Heritage Resources Agency (SAHRA) and Free State Heritage Resources Authority (FSHRA).
Conservation of Agricultural Resources Act (Act No. 43 of 1983)	▪ Control measures for erosion. ▪ Control measures for alien and invasive plant species. ▪ Authority – Department of Agriculture.
Free State Province Nature Conservation Ordinance 8 of 1969	▪ Provides for the listing of certain protected plant species.

The relationship between the Project and certain key pieces of environmental legislation is discussed in the subsections to follow.

5.2.2 National Environmental Management Act

According to Section 2(3) of the National Environmental Management Act (NEMA) (Act No. 107 of 1998), "*development must be socially, environmentally and economically sustainable*", which means the integration of these three factors into planning, implementation and decision-making so as to ensure that development serves present and future generations.

The proposed Project requires authorisation in terms of NEMA and the EIA is being undertaken in accordance the EIA Regulations of 2014 (as amended), which consist of the following:

- EIA procedure - GN No. R 982 (4 December 2014), as amended;
- Listing Notice 1 - GN No. R 983 (4 December 2014), as amended;
- Listing Notice 2 - GN No. R 984 (4 December 2014), as amended; and
- Listing Notice 3 - GN No. R 985 (4 December 2014), as amended.

The Project triggers activities under Listing Notices 1, 2 and 3, and thus needs to be subjected to a Scoping and EIA process. The listed activities are explained in the context of the project in **Table 3** above and **Table 4** below.

Table 4: Listed Activities Triggered by the PV Sites with BESS

Project Components	Relevant Listed Activities	Description of relevance
PV Solar Plant	***GN No. R.983 –***	
	Activity no. 12(ii)(a - c)	Infrastructure and structures with a physical footprint of 100 square metres or more within 32 m from watercourses.
	Activity no. 19	Construction activities within a watercourse.
	Activity no. 26	The facility will be located on land previously used for mining, although the Project is an energy infrastructure development. Although there is an existing mining right by Harmony Gold Mining Company Ltd on the area in question, a consent letter was received from the mining company. There is also a Tripartite and Rehabilitation Agreement between Harmony Gold Mining Company Ltd, MLM and the Applicant related to the rehabilitation obligations.
	Activity no. 27	Clearance of areas consisting of indigenous vegetation associated with the construction footprint. Area of indigenous vegetation to be cleared includes: ▪ Phase 1: Approximately 358 Ha; ▪ Phase 2: Approximately 325 Ha.
	Activity no. 28(i) & (ii)	Footprint of Project on land that was previously used for agricultural purposes, prior to mining, outside of an urban area.
	GN No. R.984 –	
	Activity no. 1	The planned generation capacity of the Solal PV Plant is 400 MW with 80 MW (320 MWh) BESS.
	Activity no. 15	Cumulative area to be cleared exceeds 20 ha. Area of indigenous vegetation to be cleared includes: ▪ Phase 1: Approximately 358 Ha; Phase 2: Approximately 325 Ha.
	GN No. R.985 –	
	Activity no. 12 - (b)(i), (ii) & (iv)	Clearance of indigenous vegetation within areas consisting of endangered ecosystems, CBAs and within 100 m from the edge of a watercourse or wetland.
	Activity no. 14(ii)(a - c) - (b)(i)(ff)	Infrastructure within watercourses / 32 m from watercourses within CBAs
BESS	***GN No. R.983 –***	
	Activity no. 14	Dangerous goods associated with the BESS.
	Activity no. 26	The facility will be located on land previously used for mining.
	Activity no. 27	Clearance of more than 1 Ha of indigenous vegetation associated with the construction footprint.
	Activity no. 28(i) & (ii)	The facility will be located on land previously used for agricultural purposes, prior to mining.
	GN No. R.984 –	
	Activity no. 4	The proposed BESS will not consist of an electrolyte (varying from zinc-bromide, vanadium) but is of Li-Ion technology of which Lithium is considered hazardous. The facility size for each phase of 40MW/ 160MWh storage will be approximately 60 units each sized at 7m length x 1.6m width x 2.5m high.
	GN No. R.985 –	
	Activity no. 12 - (b)(i), (ii) & (iv)	Clearance of indigenous vegetation within areas consisting of endangered ecosystems, CBAs and within 100 m from the edge of a watercourse or wetland.

Project Components	Relevant Listed Activities	Description of relevance
	Activity no. 14(ii)(a - c) - (b)(i)(ff)	Infrastructure within watercourses / 32 m from watercourses within CBAs
Roads	***GN No. R.983 –***	
	Activity no. 12(ii)(a - c)	Access roads with a physical footprint of 100 square metres or more within 32 m from watercourses.
	Activity no. 19	Construction activities associated with access roads within a watercourse.
	Activity no. 24(ii)	Access roads to and within the Phase 1 and Phase 2 Sites (construction and operational phases). With regard to the roads, the internal roads will vary from 4m to 7m wide and will be gravel. The entrance road will exceed 7m, most likely 7.4m wide.
	Activity no. 48(i)(a - c)	Expansion of roads within watercourse(s) / within 32 m from watercourse(s).
	Activity no. 56(i) & (ii)	Widening and lengthening of existing roads to grant access to the Phase 1 and Phase 2 Sites.
	GN No. R.985 –	
	Activity no. 4 - (b)(i)(ee)	The internal roads will vary from 4m to 7m wide and will be gravel. The entrance road will exceed 7m, most likely 7.4m wide. Certain sections of the access roads will encroach into Critical Biodiversity Areas (CBAs).
	Activity no. 12 - (b)(i), (ii) & (iv)	Clearance of indigenous vegetation within areas consisting of endangered ecosystems, CBAs and within 100 m from the edge of a watercourse or wetland.
	Activity no. 14(ii)(a - c) - (b)(i)(ff)	Infrastructure within watercourses / 32 m from watercourses within CBAs
	Activity no. 18 - (b)(i)(ee) & (hh)	Widening and lengthening of existing roads to grant access to the Phase 1 and Phase 2 Sites, within CBAs and within 100 m from the edge of a watercourse or wetland.
	Activity no. 23(ii)(a) & (c) - (b)(i)(ee)	Expansion of roads within watercourse(s) / within 32 m from watercourse(s), within CBAs.
Water & Stormwater	***GN No. R.983 –***	
	Activity no. 9(i) & (ii)	Storm water measures and management will be necessary as part of the terrain layout and planning. Water distribution over terrain to certain points for use in cleaning panels.
	Activity no. 12(ii)(a - c)	Water pipeline and stormwater infrastructure traverse / closer than 32 m from watercourses.
	Activity no. 19	Construction activities associated with water pipeline and stormwater infrastructure within a watercourse.
	Activity no. 45(i) & (ii)	Storm water measures and management will be necessary as part of the terrain layout and planning. Water distribution over terrain to certain points for use in cleaning panels.
	Activity no. 48(i)(a - c)	Expansion of infrastructure for the bulk transportation of water or storm water within watercourse(s) / within 32 m from watercourse(s).
	GN No. R.985 –	
	Activity no. 12 - (b)(i), (ii) & (iv)	Clearance of indigenous vegetation within areas consisting of endangered ecosystems, CBAs and within 100 m from the edge of a watercourse or wetland.
	Activity no. 14(ii)(a - c) - (b)(i)(ff)	Infrastructure within watercourses / 32 m from watercourses within CBAs.
	Activity no. 23(ii)(a) & (c) - (b)(i)(ee)	Expansion of infrastructure within watercourses / 32 m from watercourses within CBAs.

Note that the dimensions of the project infrastructure and components should be regarded as approximates due to the dynamic nature of the planning and design process. As a conservative approach, all possible activities that could possibly be triggered by the Project were included in the Application Form. A refinement of these activities took place as the EIA process unfolded.

5.2.3 National Environmental Management: Waste Act

Amongst others, the purpose of the National Environmental Management: Waste Act (NEM:WA) (Act No. 59 of 2008) includes the following:

1. To reform the law regulating waste management in the country by providing reasonable measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development;
2. To provide for institutional arrangements and planning matters;
3. To provide for specific waste management measures;
4. To provide for the licensing and control of waste management activities;
5. To provide for the remediation of contaminated land; and
6. To provide for compliance and enforcement.

Some key definitions from this Act include:

- "*Disposal*" – the burial, deposit, discharge, abandoning, dumping, placing or release of any waste into, or onto, any land.
- "*General waste*" means waste that does not pose an immediate hazard or threat to health or to the environment, and includes -
  - domestic waste;
  - building and demolition waste;
  - business waste: and
  - inert waste;
- "Hazardous waste" – any waste that contains organic or inorganic elements or compounds that may, owing to the inherent physical, chemical or toxicological characteristics of that waste, have a detrimental impact on health and the environment.
- "Storage" – the accumulation of waste in a manner that does not constitute treatment or disposal of that waste.
- "Waste" – any substance, whether or not that substance can be reduced, re-used, recycled and recovered -
  - That is surplus, unwanted, rejected, discarded, abandoned or disposed of;
  - Which the generator has no further use of for (he purposes of production;
  - That must be treated or disposed of; or
  - That is identified as a waste by the Minister by notice in the Gazette, and includes waste generated by the mining, medical or other sector, but -
    - A by-product is not considered waste; and
    - Any portion of waste, once re-used, recycled and recovered, ceases to be waste.

GN No. R. 921 of 29 November 2013 (as amended) contains a list of waste management activities that have, or are likely to have, a detrimental impact on the environment. If any of the waste management activities are triggered in Category A and Category B, a Waste Management Licence

is required. Activities listed in Category C need to comply with the relevant National Norms and Standards.

No authorisation will be required in terms of NEM:WA for the Project as no listed waste management activities are triggered. The following is noted with regards to waste management for the Project:

- Construction phase –
  - Temporary waste storage facilities will remain below the thresholds contained in the listed activities under Schedule 1 of NEM:WA; and
  - The Environmental Management Programme (EMPr) will make suitable provisions for waste management, including the storage, handling and disposal of waste.
- Operational phase –
  - Minimum waste will be generated during the operational phase;
  - Waste from the on-site office and workshop will be sent to the relevant municipal sites;
  - Waste generated during maintenance or replacement of panels and inverters will be sent to suitable disposal sites; and
  - With regards to the BESS, used batteries will be removed by the suppliers who will be responsible for ensuring compliance with all relevant legal requirements.

5.2.4 Mineral and Petroleum Resources Development Act (Act No. 28 of 2002)

The purpose of the Mineral and Petroleum Resources Development Act (MPRDA) (Act No. 28 of 2002) is to make provision for equitable access to and sustainable development of the nation's mineral and petroleum resources and to provide for matters related thereto. This act defines mining as "any operation or activity for the purposes of winning any mineral on, in or under the earth, water or any residue deposit, whether by underground or open working or otherwise and includes any operation or activity incidental thereto".

It is not intended for any mining-related activities to be undertaken as part of the Project, such as creating borrow pits for sourcing of construction material.

Both of the Phase 1 and Phase 2 Sites are located on land that was previously used for mining purposes, which form part of the Harmony Gold's Welkom mining operations (MetroGIS, 2015). In terms of Section 53 of the MPRDA, any person who intends to use the surface of any land in any way which may be contrary to any object of this Act or which is likely to impede any such object must apply to the Minister for approval in the prescribed manner. Accordingly, an application was submitted to the DMRE in terms of the aforementioned provision of the MPRDA by the Applicant. In response, the DMRE stated *inter alia* that there is an existing mining right by Harmony Gold Mining Company Ltd on the area in question. DMRE further stated that due to the fact that the Applicant reached an agreement and submitted a consent letter from the mining company concerned and that no objections were raised by that mining company, no objection is raised by

DMRE against the proposed Project. Copies of the letters from Harmony Gold Mining Company Ltd (original and updated letters) and DMRE are contained in **Appendix D**.

5.2.5 National Water Act (Act No. 36 of 1998)

The purpose of the National Water Act (NWA) (Act No. 36 of 1998) is to ensure that the nation's water resources are protected, used, developed, conserved, managed and controlled in ways which take into account amongst other factors:

- Meeting the basic human needs of present and future generations;
- Promoting equitable access to water;
- Redressing the results of past racial and gender discrimination;
- Promoting the efficient, sustainable and beneficial use of water in the public interest;
- Facilitating social and economic development;
- Providing for growing demand for water use; protecting aquatic and associated ecosystems and their biological diversity;
- Reducing and preventing pollution and degradation of water resources;
- Meeting international obligations;
- Promoting dam safety; and
- Managing floods and droughts.

The Department of Water and Sanitation (DWS) is the custodian of South Africa's water resources.

Some key definitions from the NWA include:

- "*Pollution*" – the direct or indirect alteration of the physical, chemical or biological properties of a water resource so as to make it (a) less fit for any beneficial purpose for which it may reasonably be expected to be used; or (b) harmful or potentially harmful;
- "*Waste*" – includes any solid material or material that is suspended, dissolved or transported in water (including sediment) and which is spilled or deposited on land or into a water resource in such volume, composition or manner as to cause, or to be reasonably likely to cause, the water resource to be polluted; and
- "*Water resource*" – includes a watercourse, surface water, estuary, or aquifer.

The Project may entail the following activities that constitute water uses in terms of Section 21 of the NWA, which will be confirmed in consultation with DWS:

- Section 21(c) - Impeding or diverting the flow of water in a watercourse; and
- Section 21(i) - Altering the bed, banks, course or characteristics of a watercourse.

A Water Use Licence Application will be submitted to DWS to seek authorisation in terms of the NWA for the abovementioned water uses. The process to seek authorisation for the water uses was initiated via DWS' Electronic Water Use Licence Application and Authorisation System (e-WULAAS), and discussions were held with the DWS Vaal Proto Catchment Management Agency

(CMA). The process is being undertaken in accordance with the Water Use Licence Application and Appeals Regulations (GN No. R. 267 of 24 March 2017).

5.2.6 National Environmental Management: Air Quality Act (Act No. 39 of 2004)

The purpose of the National Environmental Management: Air Quality Act (NEM:AQA) (Act No. 39 of 2004) is to reform the law regulating air quality by providing measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development. This Act aims to promote justifiable economic and social development; to provide for national norms and standards regulating air quality monitoring, management and control by all spheres of government, and for specific air quality measures.

Some key definitions from this Act include:

- "*Air pollution*" – any change in the composition of the air caused by smoke, soot, dust (including fly ash), cinders, solid particles of any kind, gases, fumes, aerosols and odorous substances.
- "*Atmospheric emission*" or "*emission*" – any emission or entrainment process emanating from a point, non-point or mobile source that results in air pollution.
- "*Non-point source*" – a source of atmospheric emissions which cannot be identified as having emanated from a single identifiable source or fixed location, and includes veld, forest and open fires, mining activities, agricultural activities and stockpiles.
- "*Point source*" – single identifiable source and fixed location of atmospheric emission, and includes smoke stacks and residential chimneys.

This Act provides for the listing of activities which result in atmospheric emissions that pose a threat to health or the environment. No person may without an Atmospheric Emission Licence (AEL) conduct any such listed activity.

No AEL is required for the Project. Provision is made in the EMPr to manage impacts to air quality as a result of the Project during the construction phase.

5.2.7 National Environmental Management: Biodiversity Act (Act 10 of 2004)

The purpose of the National Environmental Management: Biodiversity Act (NEM:BA) (Act 10 of 2004) is to provide for the management and conservation of SA's biodiversity within the framework of NEMA.

The Act allows for the publication of provincial and national lists of ecosystems that are threatened and in need of protection. The list should include:

- *Critically Endangered Ecosystems*, which are ecosystems that have undergone severe ecological degradation as a result of human activity and are at extremely high risk of irreversible transformation.

- *Endangered Ecosystems*, which are ecosystems that, although they are not critically endangered, have nevertheless undergone ecological degradation as a result of human activity.
- *Vulnerable Ecosystems*, which are ecosystems that have a high risk of undergoing significant ecological degradation.
- *Protected Ecosystems*, which are ecosystems that are of a high conservation value or contain indigenous species at high risk of extinction in the wild in the near future.

Similarly, the Act allows for the listing of endangered species, including critically endangered species, endangered species, vulnerable species and protected species. A person may not carry out a restricted activity (including trade) involving listed threatened or protected species without a permit.

The Regulations on the management of Listed Alien and Invasive Species were promulgated on 1 August 2014. The Listed Invasive Species were also published on this date and were subsequently amended in GN 864 of 29 July 2016.

Some key definitions from this Act include:

- "*Alien species*" –
  - A species that is not an indigenous species; or
  - An indigenous species translocated or intended to be translocated to a place outside its natural distribution range in nature, but not an indigenous species that has extended its natural distribution range by natural means of migration or dispersal without human intervention.
- "*Biological diversity*" or "*biodiversity*" – the variability among living organisms from all sources including, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part and also includes diversity within species, between species, and of ecosystems.
- "*Indigenous species*" – a species that occurs, or has historically occurred, naturally in a free state in nature within the borders of the Republic, but excludes a species that has been introduced in the Republic as a result of human activity.
- "*Invasive species*" – any species whose establishment and spread outside of its natural distribution range -
  - Threaten ecosystems, habitats or other species or have demonstrable potential; and
  - May result in economic or environmental harm or harm to human health.
- "*Species*" – a kind of animal, plant or other organism that does not normally interbreed with individuals of another kind, and includes any sub-species, cultivar, variety, geographic race, strain, hybrid or geographically separate population.

The implications of this Act for the Project *inter alia* include the requirements for managing invasive and alien species, protecting threatened ecosystems and species, as well as for rehabilitation.

The findings from the Terrestrial and Aquatic Ecological Impact Assessments that were undertaken for the Project are included in **Section 12.4** and **Section 12.3** below, respectively.

5.2.8 National Heritage Resources Act (Act No. 25 of 1999)

The purpose of the National Heritage Resources Act (NHRA) (Act No. 25 of 1999) is to protect and promote good management of SA's heritage resources, and to encourage and enable communities to nurture and conserve their legacy so it is available to future generations.

In terms of Section 38 of this Act, certain listed activities require authorisation from provincial agencies:

- The construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier exceeding 300 m in length;
- The construction of a bridge or similar structure exceeding 50 m in length;
- Any development or other activity which will change the character of a site -
  - Exceeding 5 000 m^2 in extent; or
  - Involving three or more existing erven or subdivisions thereof; and
- The re-zoning of a site exceeding 10 000 m^2 in extent.

The findings from the Phase 1 Cultural Heritage Impact Assessment and Desktop Palaeontological Impact Assessment that were undertaken for the Project are included in **Section 12.7** and **Section 12.8** below, respectively.

5.3 Governance of Energy in SA

SA has expressed and entrenched its commitment to promoting the use of renewable energy and implementing Energy Efficiency through the following (amongst others):

- SA is a signatory to various international treaties and conventions relating to climate change and greenhouse gas (GHG), such as –
  - United Nations Framework Convention on Climate Change;
  - Kyoto Protocol; and
  - Paris Agreement.
- SA has developed the following related policy frameworks –
  - White Paper on Energy Policy (1998);
  - White Paper on Renewable Energy (2003);
  - Integrated Energy Plan (2003);
  - Integrated Resource Plan (IRP) 2010;
  - Integrated Resource Plan (IRP) 2019
  - National Climate Change Response White Paper (2011);
  - Post-2015 National Energy Efficiency Strategy;

- The National Development Plan (2030);
- Climate Change Bill (2018); and
- Carbon Tax Bill (2019).

❖ SA has developed the following related legal frameworks –

- Electricity Regulation Act (Act No. 4 of 2006);
- National Energy Act (Act No. 34 of 2008); and
- Income Tax Act (1962) - tax incentive provided for Section 12L.

❖ The former Department of Environmental Affairs (DEA), which is now known as DFFE, developed EIA Guideline for Renewable Energy Projects (2015).

❖ SA's related voluntary instruments include –

- South African National Standard (SANS) 941 energy-efficiency of electrical and electronic equipment; and
- SANS 50001 energy management standard.

5.4 Guidelines

The following guidelines were considered during the preparation of the EIA Report:

❖ Guideline on Alternatives, EIA Guideline and Information Document Series (DEA&DP, 2010a);
❖ Guideline on Need and Desirability, EIA Guideline and Information Document Series (DEA&DP, 2010b);
❖ Integrated Environmental Management Guideline Series 7: Public Participation in the EIA Process (DEA, 2010);
❖ EIA Guideline for Renewable Energy Projects (Department of Environmental Affairs (DEA, 2015); and
❖ Guidelines for Involving Specialists in the EIA Processes Series (Brownlie, 2005).

5.5 National and Regional Plans

The following regional plans were considered during the execution of the EIA Phase (amongst others):

❖ Municipal Spatial Development Frameworks (SDFs);
❖ Municipal Integrated Development Plans (IDPs);
❖ Relevant national, provincial, district and local policies, strategies, plans and programmes; and
❖ Free State Biodiversity Plan (2015) (Collins, 2016).

5.6 Renewable Energy Development Zones

A Strategic Environmental Assessment (SEA) was undertaken by DFFE in order to identify geographical areas most suitable for the rollout of wind and solar PV energy projects and the

supporting electricity grid network. These areas are referred to as Renewable Energy Development Zones (REDZs), in which development will be incentivised and streamlined. The proposed Project's Phase 1 and Phase 2 Sites in relation to the REDZs are shown in **Figure 6** below.

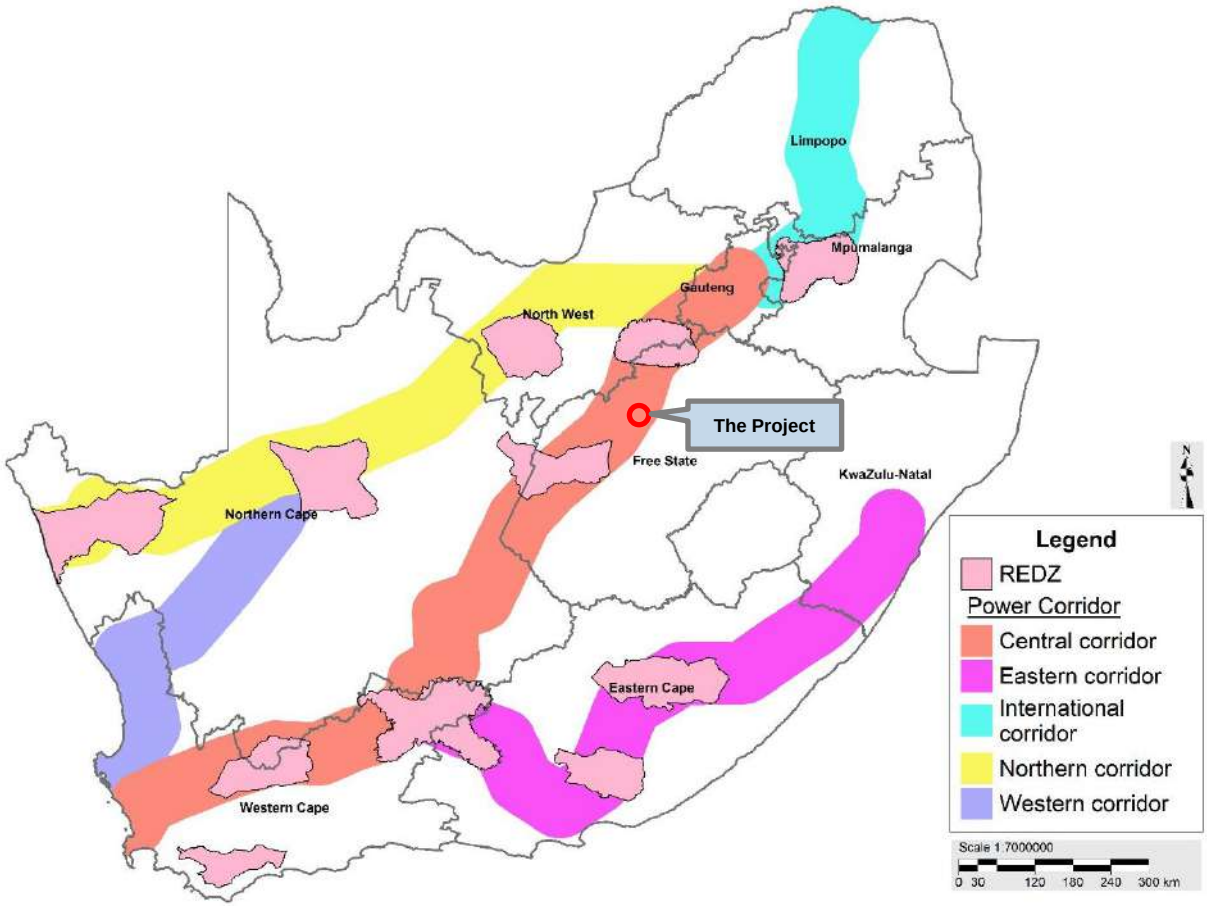


Figure 6: The Project in relation to REDZs

As shown in **Figure 6** above, the Project is not located within any REDZs. According to GNR 114 of 16 February 2018, where an Application for Environmental Authorisation for large scale wind or solar PC facilities is being made and these facilities fall outside of the REDZs then these applications will be considered in terms of the requirements of the EIA Regulations of 2014 (as amended).

As shown in **Figure 6** above, the Project falls within the Central Corridor of the Strategic Transmission Corridors, in terms of GNR 113 of 16 February 2018. As mentioned, a separate EIA will be undertaken for the proposed power lines associated with the Solar PV Plant.

6 SCOPING AND EIA PROCESS

6.1 Environmental Assessment Authorities

In terms of NEMA the lead decision-making authority for the environmental assessment is DFFE, as the competent authority for renewable energy related applications. Due to the geographic location of the Project, DESTEA is regarded as one of the key commenting authorities in terms of NEMA during the execution of the EIA, and all documentation will thus be copied to this Department (amongst others).

Various other authorities with jurisdiction over elements of the receiving environment or project activities (refer to **Section 5.2** above) were consulted during the course of the EIA. Refer to the database of Interested and Affected Parties (IAPs) contained in **Appendix I** for a list of the government departments.

6.2 Environmental Assessment Practitioner

Nemai Consulting was appointed by SunElex as the independent Environmental Assessment Practitioner (EAP) to undertake the environmental assessment for the proposed Project.

In accordance with Appendix 3, Section 3(1)(a) of GN No. R 982 of 4 December 2014 (as amended), this section provides an overview of Nemai Consulting and the company's experience with EIAs, as well as the details and experience of the EAPs that form part of the Scoping and EIA team.

Nemai Consulting is an independent, specialist environmental, social development and Occupational Health and Safety (OHS) consultancy, which was founded in December 1999. The company is a 100% black female owned company, with a level 1 BBBEE rating. The company is directed by a team of experienced and capable environmental engineers, scientists, ecologists, sociologists, economists and analysts. The company has offices in Randburg (Gauteng) and Durban (KZN).

The core members of Nemai Consulting that are involved with the Scoping and EIA process for the project are captured in **Table 5** below, and their respective Curricula Vitae are contained in **Appendix F**. The oath of the EAP is contained in **Appendix L**.

Table 5: Scoping and EIA Core Team Members

Name	Qualifications	Experience	Duties
Ms D. Naidoo	BSc Eng (Chem)	24 years	• Project Manager - EIA Process
Mr D. Henning	MSc (River Ecology)	19 years	• Project Leader - EIA Process

6.3 Environmental Assessment Triggers

The process for seeking authorisation under NEMA is undertaken in accordance with GN No. R. 982 of 4 December 2014 (as amended), promulgated in terms of Chapter 5 of NEMA. Based on the types of activities involved the requisite environmental assessment for the project is a Scoping and EIA process. Refer to **Section 5** above for the project's legal framework and specifically the activities triggered by the project in terms of Listing Notices 1, 2 and 3 of the EIA Regulations of 2014 (as amended).

As mentioned, environmental authorisation for the Solar PV Plant: Phase 1 and Phase 2 Sites and for the proposed power lines is being applied for separately.

6.4 EIA Process

6.4.1 Overview of EIA Process

An outline of the Scoping and EIA process for the proposed Project is provided in **Figure 7** below.

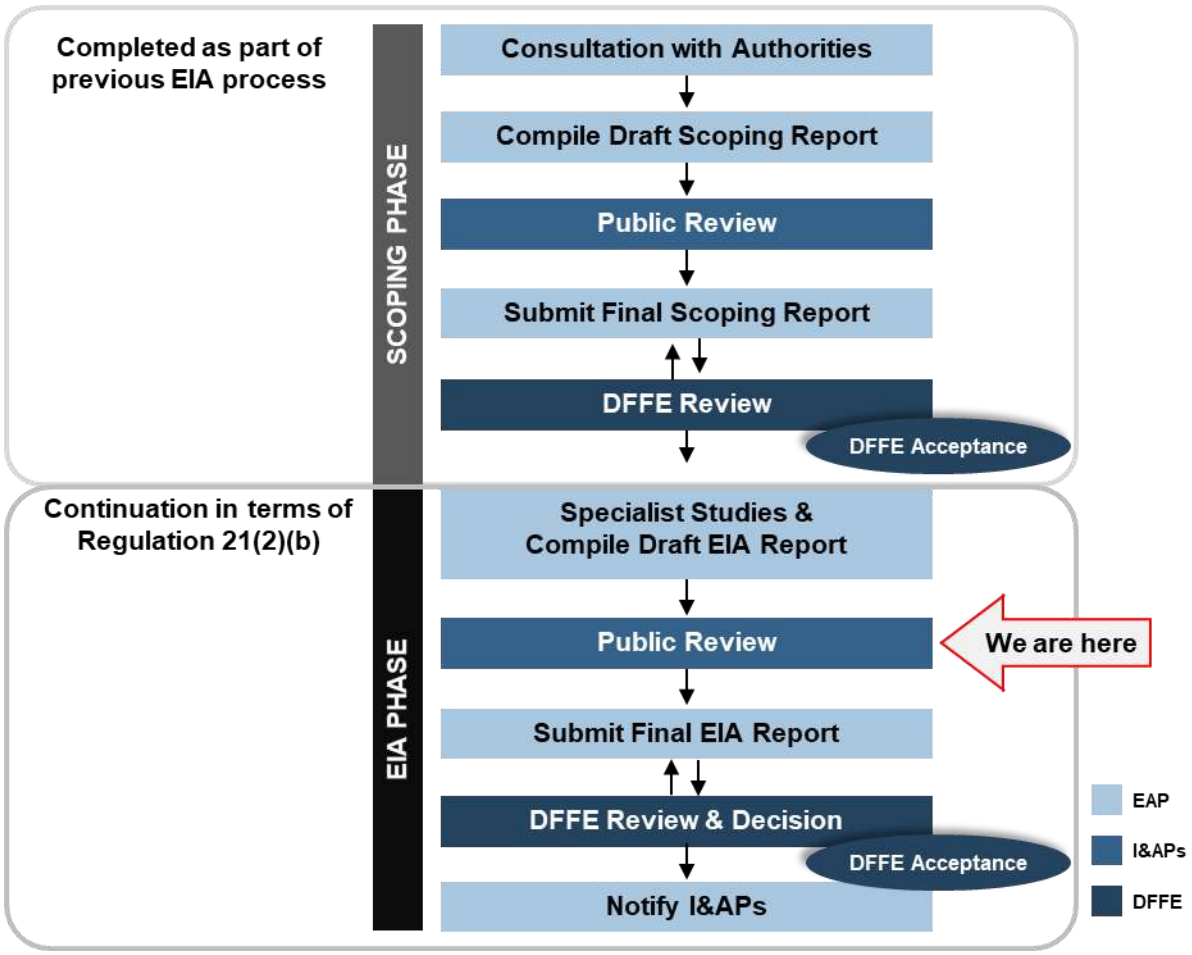


Figure 7: EIA process

6.4.2 The EIA Process to Date

The following key milestones have been reached as part of the EIA process to date

1. The Applicant convened a Pre-application Meeting with DFFE on 22 January 2020 (refer to minutes contained in **Appendix E**).
2. A Draft Scoping Report, which conformed to Appendix 2 of GN No. R. 982 (4 December 2014), was compiled. This document included the following salient information (amongst others):
   a. A Scoping-level impact assessment to identify potentially significant environmental issues for detailed assessment during the EIA phase;
   b. Screening and investigation of feasible alternatives to the project for further appraisal during the EIA phase; and
   c. A Plan of Study, which explained the approach to be adopted to conduct the EIA for the proposed project.
3. The Application for Environmental Authorisation and Draft Scoping Report were submitted to DFFE on 20 March 2020.
4. The notification of the review of the Draft Scoping Report was undertaken during March 2020. The initial 30-day review period that was conveyed in the notifications, was from 20 March until 24 April 2020.
5. IAPs were informed on 27 March 2020 that the public review period had been suspended due to the National State of Disaster declared for the COVID-19 pandemic.
6. Comments on the Application Form and Draft Scoping Report were received from DFFE on 9 June 2020.
7. DFFE was engaged with in June 2020 to determine the requirements for the continuation of the review of the Draft Scoping Report for the proposed Project: Phase 1 and Phase 2 Sites in light of the Directions Regarding Measures to Address, Prevent and Combat the Spread of COVID-19 relating to National Environmental Management Permits and Licences (GN No. 650 of 5 June 2020) (hereafter referred to as “Directions”). A Public Participation Plan (PPP) for the continuation of the review of the Draft Scoping Report was compiled in terms of the Directions, which was submitted to DFFE on 24 June 2020. DFFE approved the PPP on 26 June 2020.
8. A letter was submitted to DFFE on 9 July 2020 requesting an extension, in terms of Regulation 3(7) of GN No. R. 982 (4 December 2014), to the timeframes for the submission of the Final Scoping Report. This request was approved by DFFE on 21 July 2020.
9. The Final Scoping Report was submitted to DFFE on 10 September 2020.
10. DFFE accepted the Scoping Report and Plan of Study for the EIA on 5 October 2020 (refer to **Appendix D**), which allowed the commencement of the EIA phase.
11. The Application subsequently lapsed and a new Application Form (contained in **Appendix E**) and Draft EIA Report were submitted to DFFE, in accordance with Regulation 21(2) of the EIA Regulations of 2014 (as amended). Another Pre-application Meeting was held with DFFE on 6 August 2021 (refer to the minutes appended to the Application Form contained in **Appendix E**). Notification of the lapsing of the Application and the way forward for the EIA in terms of Regulation 21(2) was provided to IAPs.

12. Approval was received from DFFE to submit a combined application in terms of Regulation 11(1) of the EIA Regulations of 2014 (as amended) for the Project's Phase 1 and Phase 2 Sites.

6.5 Objectives of the EIA Phase

The objectives of the EIA phase, based on the EIA Regulations of 2014 (as amended), are captured in **Section 1** above.

6.6 Alignment with the Plan of Study

The Plan of Study, which was contained in the Scoping Report and was accepted by DFFE, explained the approach to be adopted to conduct the EIA for the proposed Project. The manner in which the EIA Report addresses the requirements of the Plan of Study is shown in **Table 6** below.

Table 6: Alignment of EIA Report with Plan of Study

No.	Plan of Study Requirement	EIA Report Reference
1.	Assess pertinent environmental issues identified during Scoping through: 1. Applying an appropriate impact assessment methodology. 2. Conducting specialist studies. 3. Identifying suitable mitigation measures.	• **Section 12** • **Section 13**
2.	Assessment of feasible alternatives.	• **Section 14**
3.	Specialist studies to be completed in accordance with Terms of Reference.	• **Section 12**; and • **Appendix H**
4.	Public participation to include the following: • Update the database of IAPs. • Allow for the review of the Draft EIA Report. • Convene a public meeting. • Compile and maintain a Comments and Responses Report (CRR). • Notification of DFFE's decision.	**Section 15**
5.	EIA Report to satisfy the minimum requirements stipulated in Appendix 3 of GN No. R. 982 of 2014 EIA Regulations (as amended).	**Section 2**
6.	Authority Consultation.	**Section 15**

6.7 Addressing DFFE's Requirements

6.7.1 Acceptance of the Scoping Report

The manner in which DFFE's specific requirements, as listed in the letter received from this Department for the acceptance of the Scoping Report (refer to **Appendix D**), have been attended to are described in **Table 7** below.

Table 7: DFFE's Specific Requirements - Acceptance of the Scoping Report

DFFE's Requirements	Response/Status
(a) Listed Activities	
(i) The EIAr must provide an assessment of the impacts and mitigation measures for each of the listed activities applied for.	Refer to **Section 13** below.
(iii) The listed activities represented in the EIAr and the application form must be the same and correct.	The listed activities triggered are explained in the context of the Project in **Table 4** and **Table 5** above.
(iv) Note that for every activity, a sub-activity must be selected i.e. Listing Notice 1, Activity 12(ii)(a). The EIAr must assess the correct sub listed activity for each listed activity applied for.	Refer to **Table 4** and **Table 5** above.
(v) Kindly include the proposed threshold for each activity. For each listed activity, where possible, provide the proposed threshold/footprint associated with the listed activity i.e. the footprint of infrastructure in m^2, the removal of material in m^3, the clearance of land in m^2, number of BESS per site (each individual unit, if applicable), the storage of hazardous goods in m^3, road dimensions etc.	Refer to **Table 4** and **Table 5** above.
(vi) If the activities applied for in the application form differ from those mentioned in the final SR, an amended application form must be submitted.	The new Application Form is contained in **Appendix E**.
(b) Public Participation	
(i) Please ensure that comments from all relevant stakeholders are submitted to the Department with the ElAr. This includes but is not limited to the Free State Department of Small Business Development, Tourism and Environmental Affairs (DESTEA), the Department of Transport, the Matjhabeng Local Municipality, the Lejweieputswa District Municipality, the Department of Water and Sanitation (DWS), the South African National Roads Agency Limited (SANRAL), the South African Heritage Resources Agency (SAHRA), the Endangered Wildlife Trust (EWT), BirdLife SA, the Department of Mineral Resources; Department of Agriculture and Rural Development and the Department of Environmental Affairs: Directorate Biodiversity and Conservation.	Copies of the Draft EIA Report were provided to the key regulatory and commentary authorities listed in **Section 15** below. Comments received on the Draft EIA Report will be appended to the Final EIA Report, which will be submitted to DFFE. These comments will also be incorporated into the Comments and Responses Report (CRR).
(i) Please ensure that all issues raised and comments received during the circulation of the draft SR and draft EIAr from registered I&APs and organs of state which have jurisdiction in respect of the proposed activity are adequately addressed in the final ElAr. Proof of correspondence with the various stakeholders must be included in the final EIAr. Should you be unable to obtain comments, proof should be submitted to the Department of the attempts that were made to obtain comments.	The CRR contained in **Appendix J** includes comments received during the Scoping phase. The CRR will be updated with comments received during the review of the Final EIA Report.
(ii) A Comments and Response trail report (C&R) must be submitted with the final ElAr. The C&R report must incorporate all comments for this development. The C&R report must be a separate document from the main report and the format must be in the table format as indicated in Appendix 1 of this comments letter. Please refrain from summarising comments made by I&APs. All comments from I&APs must be copied verbatim and responded to clearly. Please note that a response such as "noted° is not regarded as an adequate response to I&AP's comments.	The CRR is contained in **Appendix J**.
(iii) Comments from I&APs must not be split and arranged into categories. Comments from each submission must be responded to individually.	The CRR is contained in **Appendix J**.
(iv) The Public Participation Process must be conducted in terms of Regulation 39, 40, 41, 42, 43 & 44 of the EIA Regulations, 2014, as amended.	The approach to Public Participation during the EIA phase is explained in **Section 15** below.
(c) Alternatives	
(i) Please provide a description of each of the preferred alternative type and provide detailed motivation on why it is preferred.	Refer to **Section 14** below.

DFFE's Requirements	Response/Status
(ii) The applicant must determine the need for decommissioning of existing facilities, structures or infrastructure. This information must inform whether there is a need to update the application form and/or to amend the terms of reference for the specialist studies.	The listed activity pertaining to decommissioning was excluded from the new Application Form contained in **Appendix E**.
(d) Layout & Sensitivity Maps	
(i) The EIAr must provide the four corner coordinate points for the proposed development site (note that if the site has numerous bend points, at each bend point coordinates must be provided) as well as the start, middle and end point of all linear activities for each of the sites. Coordinates must be in the format as prescribed in the 2014 NEMA Regulations, as amended.	Coordinates for the project components associated with the Phase 1 and Phase 2 Sites are listed in **Appendix C**. Coordinates provided are based on the Hartebeesthoek94 WGS84 Coordinate System.
(ii) The EIAr must provide the following: ▪ Clear indication of the envisioned area for the proposed solar and BESS facility; i.e. placing of BESS, PV panels and all associated infrastructure should be mapped at an appropriate scale. ▪ Clear description of all associated infrastructure. This description must include, but is not limited to the following: o Power lines; o Internal roads infrastructure; and: o All supporting onsite infrastructure such as laydown area, guard house and control room etc.	Refer to layouts shown in **Figure 3 – 5** above.
(iii) A copy of the final preferred layout map. All available biodiversity information must be used in the finalisation of the layout map. Existing infrastructure must be used as far as possible e.g. roads. The layout map must indicate the following: ▪ Permanent laydown area footprint; ▪ Internal roads indicating width (construction period width and operation period width) and with numbered sections between the other site elements which they serve (to make commenting on sections possible); ▪ Wetlands, drainage lines, rivers, stream and water crossing of roads and cables indicating the type of bridging structures that will be used; ▪ The location of sensitive environmental features on site e.g. CBAs, heritage sites, wetlands, drainage lines etc. that will be affected by the facility and its associated infrastructure; ▪ Location of access and service roads; ▪ All existing infrastructure on the site, especially railway lines and roads; ▪ Buffer areas; ▪ Buildings, including accommodation; and ▪ All "no-go" areas.	Based on the findings of the specialist studies, in particular the Water Resources Impact Assessment, Terrestrial Ecology Assessment, Avifaunal Assessment and Traffic Impact Assessment, the layouts for the Phase 1 and Phase 2 PV Sites were revised to cater for the environmental sensitivity (refer to **Section 14** below). The combined sensitivity maps for the Phase 1 and Phase 2 PV Sites are presented in **Section 16** below.
(iv) An environmental sensitivity map indicating environmental sensitive areas and features identified during the assessment process.	Sensitivity maps, based on the findings of the specialist studies, are presented in **Section 12** below. The combined sensitivity maps for the Phase 1 and Phase 2 PV Sites are presented in **Section 16** below.
(v) A map combining the final layout map superimposed (overlain) on the environmental sensitivity map.	
(v) Google maps will not be accepted.	
(e) Specialist assessments	
(i) The EAP must ensure that the terms of reference for all the identified specialist studies must include the following: ▪ A detailed description of the study's methodology; indication of the locations and descriptions of the development footprint, and all other associated infrastructures that they have assessed and are recommending for authorisations. ▪ Provide a detailed description of all limitations to the studies. All specialist studies must be conducted in the right season and providing that as a limitation will not be allowed.	Provision was made in the terms of reference for the specialist studies to cater for these requirements.

DFFE's Requirements	Response/Status
▪ Please note that the Department considers a 'no-go' area, as an area where no development of any infrastructure is allowed; therefore, no development of associated infrastructure including access roads is allowed in the `no-go' areas. ▪ Should the specialist definition of 'no-go' area differ from the Departments definition; this must be clearly indicated. The specialist must also indicate the 'no-go' area's buffer if applicable. ▪ All specialist studies must be final, and provide detailed/practical mitigation measures for the preferred alternative and recommendations, and must not recommend further studies to be completed post EA. ▪ Should a specialist recommend specific mitigation measures, these must be clearly indicated. ▪ Outcomes regarding the radiological study must be clearly explained in the subsequent reports. It must be illustrated whether the findings of the previous radiological study or a new study will be commissioned. ▪ Regarding cumulative impacts: o Clearly defined cumulative impacts and where possible the size of the identified impact must be quantified and indicated, i.e. hectares of cumulatively transformed land. o A detailed process flow to indicate how the specialist's recommendations, mitigation measures and conclusions from the various similar developments in the area were taken into consideration in the assessment of cumulative impacts and when the conclusion and mitigation measures were drafted for this project. o Identified cumulative impacts associated with the proposed development must be rated with the significance rating methodology used in the process. o The significance rating must also inform the need and desirability of the proposed development. o A cumulative impact environmental statement on whether the proposed development must proceed.	
(ii) Should the appointed specialists specify contradicting recommendations, the EAP must clearly indicate the most reasonable recommendation and substantiate this with defendable reasons; and were necessary, include further expertise advice.	The specialists did not provide contradicting recommendations.
(iii) The following Specialist Assessments will form part of the EIAr: ▪ Agricultural Impact Assessment ▪ Terrestrial Ecological Study ▪ Heritage Impact Assessment ▪ Socio-Economic Impact Assessment ▪ Visual Impact Assessment	Refer to the findings from these specialist studies contained in **Section 12** below.
(f) General	
i. It is noted that the Mining Company (Appendix D) states they will commence with rehabilitation only at the end of life of mine. The applicant will therefore have to rehabilitate where necessary prior to construction.	The sites earmarked for the development footprint will be suitably rehabilitated prior to construction.
ii. A risk assessment for each of the proposed technology alternatives (BESS) proposed must be conducted and included in the final EIAr.	Refer to **Section 9.6** and **Section 13.20** below.
iii. The proposed development must take into account the requirements of the custodians/ authorities of existing infrastructure on site when designing the layout.	Existing infrastructure that may be affected by the development is discussed in **Section 11.11** below. Existing 44kV Eskom powerlines cross the sites. Redundant 44kV lines will be replaced with 132kV lines.

DFFE's Requirements		Response/Status
		Various organisations and custodians of infrastructure, for example Eskom, Transnet, Telkom, SANRAL and the Free State Department of Police, Roads and Transport (DPRT) were also notified during the public participation process. Comments received from custodians/authorities of existing infrastructure were included in the CRR, which is contained in **Appendix J**.
iv.	The EIAr must provide the technical details for the proposed facility in a table format as well as their description and/or dimensions. A sample for the minimum information required is listed under Annexure 2 below.	Refer to **Section 9.1** below.
v.	Should a Water Use License be required, proof of application for a license must be submitted.	A Water Use Licence Application will be submitted to DWS to seek authorisation in terms of the NWA for the water uses associated with the project. The process to seek authorisation for the water uses was initiated via DWS' Electronic Water Use Licence Application and Authorisation System (e-WULAAS), and discussions were held with the DWS Vaal Proto Catchment Management Agency (CMA). The process is being undertaken in accordance with the Water Use Licence Application and Appeals Regulations (GN No. R. 267 of 24 March 2017). It is noted that the steps prescribed by the e-WULAAS are not aligned with the EIA timeframes.
vi.	It must be clarified from DMR whether S53 Approval is required or not in terms of MPRDA 28 of 2002. (Appendix D and Appendix O).	Refer to discussion contained in **Section 5.2.4** above.
vii.	The EAP must provide landowner consent for all farm portions affected by the proposed project, whether the project component is linear or not, i.e. all farm portions where the access road, solar panels and associated infrastructure is to be located.	Landowner consent was appended to the Application Form. The MLM is the landowner of all the directly affected properties. As mentioned in **Section 3** above, the Project will be developed to serve the MLM's energy requirements and will generate power for delivery to the local/national grid. The MLM's Council has formally classified this Project as an EEPP.
viii.	A construction and operational phase EMPr that includes mitigation and monitoring measures must be submitted with the final EIAr. The EMPr must include a detailed fire management and protection plan.	The EMPr, which is contained in **Appendix K**, makes provision for fire management and protection measures.
ix.	Should the applicant wish to expand the footprint of the proposed development, implications to public participation, listed activities (application form), scope of the specialist studies and impacts and mitigations must be considered and reflected clearly.	It is noted that the Phase 1 and Phase 2 Sites that were presented in the Scoping Report were based on cadastral boundaries. The layouts were refined with the progression of the technical design of the Project. The map shown in **Figure 8** below provides a comparison of original and expanded Phase 1 and Phase 2 Sites. The new areas under the increased footprints still fall on land that belongs to MLM. Provision was made in the specialist studies, public participation and assessment of impacts to cater for these new areas.

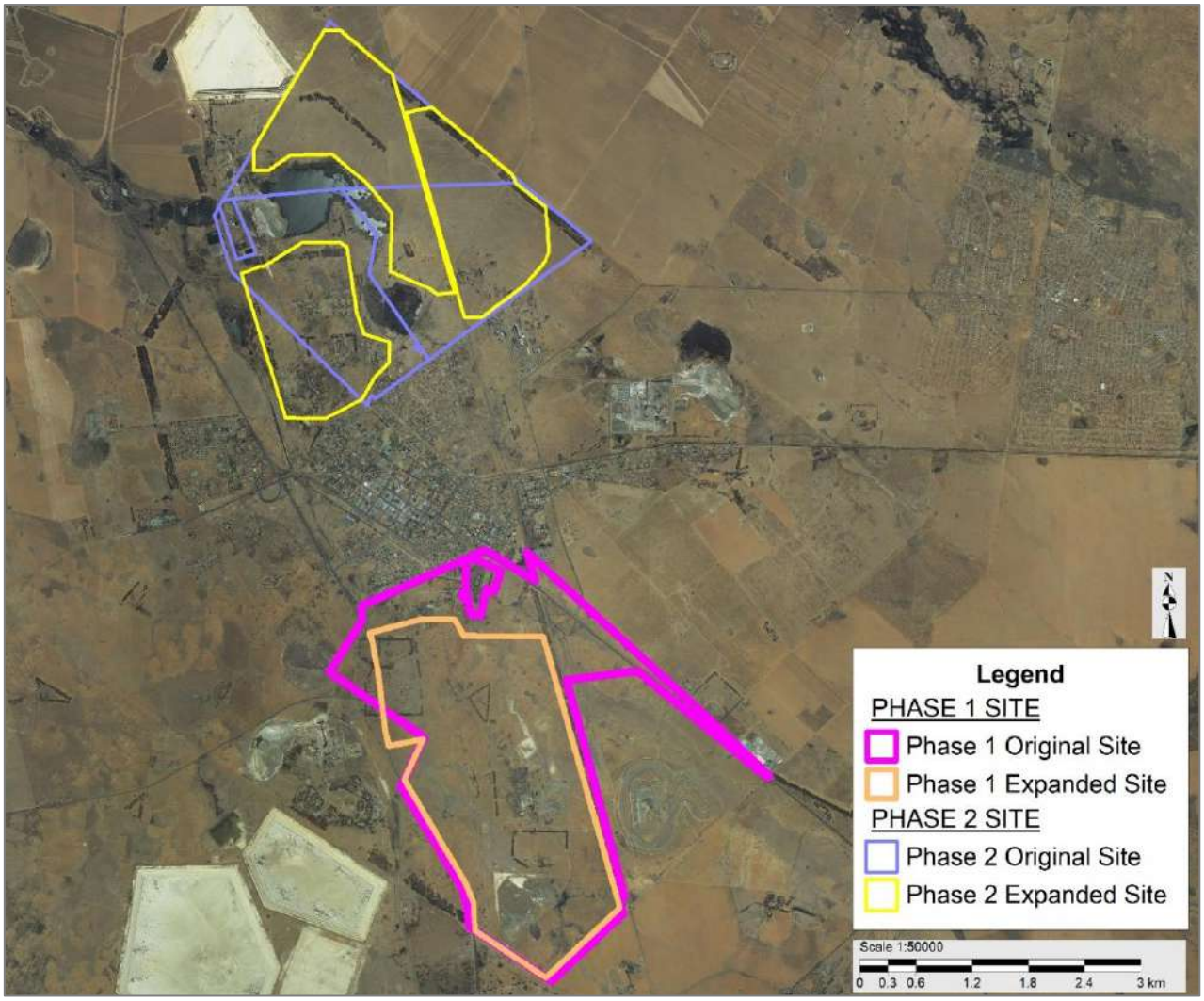


Figure 8: Comparison of original and expanded Phase 1 and Phase 2 Sites

6.8 Other Renewable Energy Applications in the Project Area

DFFE has created the SA Renewable Energy EIA Application (REEA) Database, which contains spatial data for renewable energy applications for Environmental Authorisation. It includes spatial and attribute information for both active (in process and with valid authorisations) and non-active (lapsed or replaced by amendments) applications (https://egis.environment.gov.za/renewable_energy). A map is contained in **Figure 9** below, which shows other renewable energy applications within a 50 km radius of the Project.

According to the REEA Database, renewable energy applications have been made for the properties to the immediate south and west of the Phase 1 Site and to the south-east of the Phase 2 Site (see **Figure 9** below).

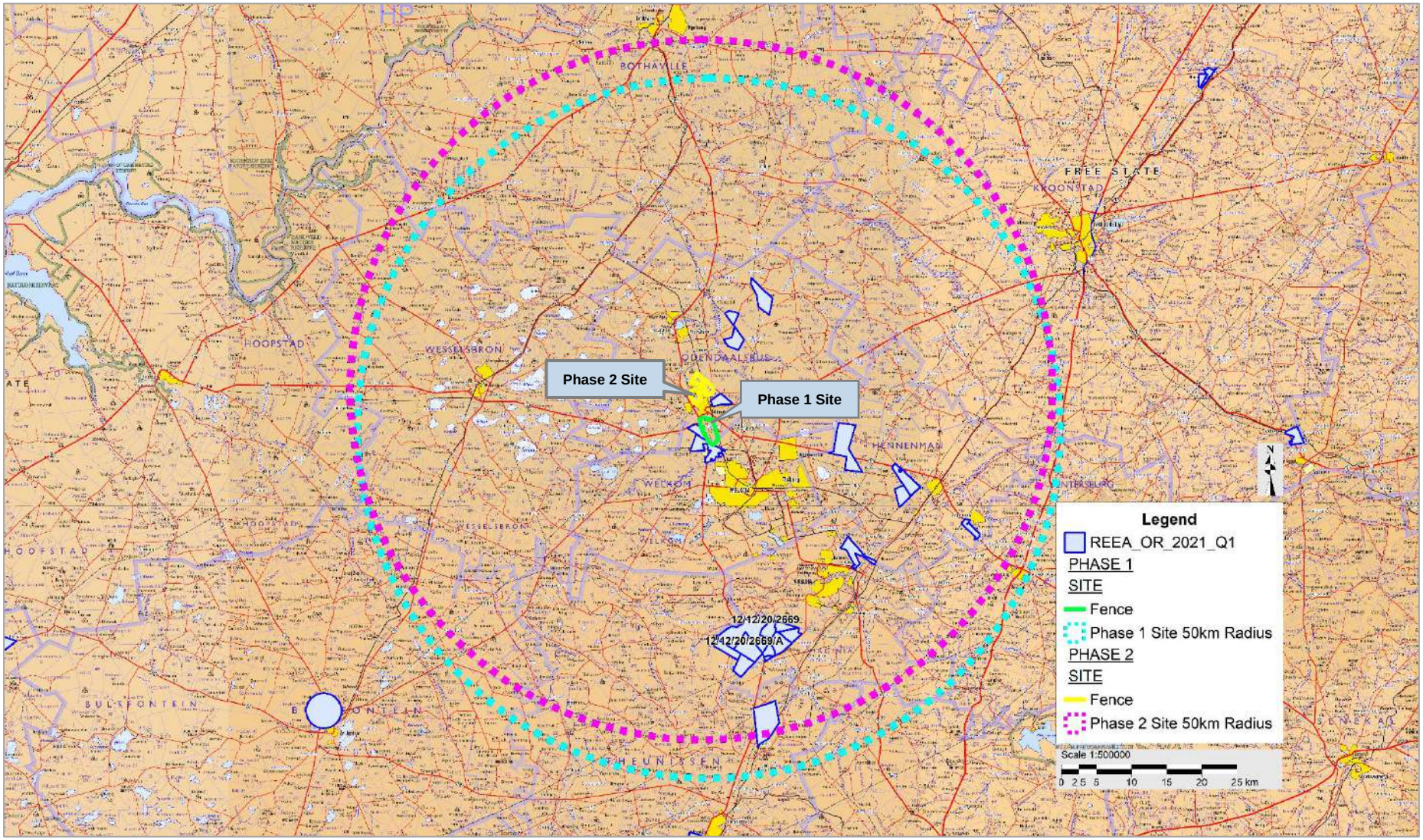


Figure 9: **Renewable energy applications in relation to the Project (within a 50 km radius)**

7 ASSUMPTIONS, GAPS AND LIMITATIONS

The following assumptions and limitations accompany the EIA process:

- As the design of the project components is still in feasibility stage, and due to the dynamic nature of the planning environment, the dimensions and layout of the infrastructure may change during the detailed design phase.
- Regardless of the analytical and predictive method employed to determine the potential impacts associated with the project, the impacts are only predicted on a probability basis. The accuracy of the predictions is largely dependent on the availability of environmental data and the degree of understanding of the environmental features and their related attributes.
- The following assumptions, gaps and limitation were noted as part of the Specialist Studies –
  - Water Resources Impact Assessment (TBC, 2020a):
    - Only a single season survey was conducted for the respective studies, this would constitute a wet season survey;
    - Due to the nature of the water resources, a comprehensive wetland assessment was achieved for the Project, supported by a desktop aquatic ecology study;
    - The use of soil and vegetation indicators for wetland delineation was limited in places where longstanding and intense crop cultivation and mining was present;
    - This assessment has not assessed any temporal trends for the Project;
    - Due to the scale of the Project, wetland delineation was limited to extent of the project area for detailed field-based delineation while wetlands beyond this (within the 500 m regulated area) were desktop delineated; and
    - The GPS used for water resource delineations is accurate to within 5m. Therefore, the wetland delineation plotted digitally may be offset by at least 5m to either side.
  - Terrestrial Ecology Assessment (TBC, 2020b):
    - A single season survey was conducted for the respective study, which would constitute a wet season survey;
    - This assessment has not assessed any temporal trends for the Project;
    - A separate Avifaunal Study was compiled for the infrastructure as such impacts on avifauna and mitigations are not discussed in this Report;
    - Some sites were not accessed based on time constraints and access limitations, therefore information for these sites were extrapolated from nearby sites and Google Earth imagery.
  - Phase 1 Cultural Heritage Impact Assessment (van Schalkwyk, 2020):
    - It is assumed that the description of the proposed Project, provided by the Client, is accurate;
    - The unpredictability of buried archaeological remains;
    - No subsurface investigation (i.e. excavations or sampling) were undertaken, since a permit from SAHRA is required for such activities; and

  - It is assumed that the EIA's public consultation process is sufficient and that it does not have to be repeated as part of the Heritage Impact Assessment.
- Desktop Paleontological Assessment (Banzai Environmental, 2020):
  - The focal point of geological maps is the geology of the area and the sheet explanations were not meant to focus on palaeontological heritage. Many inaccessible regions of South Africa have never been reviewed by palaeontologists and data is generally based on aerial photographs alone. Locality and geological information of museums and universities databases have not been kept up to date or data collected in the past have not always been accurately documented.
  - Comparable Assemblage Zones in other areas is sourced to provide information on the existence of fossils in an area which was not documented in the past. When using similar Assemblage Zones and geological formations for Desktop studies it is generally assumed that exposed fossil heritage is present within the footprint. A field-assessment will thus improve the accuracy of the desktop assessment.
- Visual Impact Assessment (SAS, 2020):
  - No specific national legal requirements for Visual Impact Assessments currently exist in South Africa. However, the assessment of visual impacts is required by implication when the provisions of relevant acts governing environmental management are considered and when certain characteristics of either the receiving environment or the proposed Project indicate that visibility and aesthetics are likely to be significant issues and that visual input is required;
  - Due to a lack of visual specialist guidelines within the Free State Province, the "Guidelines for Involving Visual and Aesthetic Specialists in the EIA Process" (Oberholzer, 2005), were used;
  - Distance, terrain, height of the proposed infrastructure and existing infrastructure within the surrounding area plays a critical role when assessing visual impacts of an area. Due to the existing mining infrastructure, various industrial structures such as power lines and substations and urban development in the immediate surroundings, it was deemed sufficient to identify all potential sensitive receptors within a 3km radius of the proposed PV Sites, on a desktop-level, which were then verified during the field assessment. The 3km radius can be considered the visual assessment zone. It should be noted that the visibility of an object decreases exponentially the further away the observer is from the source of impact;
  - All information relating to the proposed Project as referred to in this report is assumed to be the latest available information. Additionally, best practice guidelines were taken into consideration and the maximum expected heights of the infrastructure and the placement thereof utilised in the viewshed calculations as a precautionary approach;
  - Abstract or qualitative aspects of the environment and the intangible value of elements of visual and aesthetic significance are difficult to measure or quantify and as such depend to some degree on subjective judgments. It therefore is necessary to differentiate between aspects that involve a degree of subjective opinion and those that are more objective and quantifiable.

- Socio-Economic Impact Assessment (Nemai Consulting, 2020):
  - It is assumed that information obtained during the public participation process provides a comprehensive account of the community structure and community concerns for the Project;
  - The study was done with information available to the specialist at the time of executing the study, within the available time frames and budget. The sources consulted are not exhaustive and additional information which might strengthen arguments, contradict information in this report and/ or identify additional information which might exist. However, the specialist did take an evidence-based approach in the compilation of this report and did not intentionally exclude information relevant to the assessment;
  - The study was completed using the Statistics South Africa Census 2011 data and Statistics South Africa Community Survey 2016. The data might be somewhat outdated; however, it is the most comprehensive primary data available;
  - It is assumed that information obtained during the interviews provide an honest account of the community's views. It must be noted, however, that meetings are not statistically representative.

8 NEED AND DESIRABILITY

This section serves to expand on the motivation / need and desirability for the proposed development that is provided in **Section 3** above. The format contained in the Guideline on Need and Desirability (DEA&DP, 2010b) was used in **Table 8** below.

Table 8: Need and Desirability of the Project

No.	Question	Response
	NEED ('timing')	
1.	Is the land use (associated with the activity being applied for) considered within the timeframe intended by the existing approved Spatial Development Framework (SDF) agreed to by the relevant environmental authority? (i.e. is the proposed development in line with the projects and programmes identified as priorities within the IDP).	▪ The proposed Project Sites have been secured and the MLM has entered into a Long-Term Land Lease Agreement with the Applicant. ▪ The 2018 - 2019 Integrated Development Plan (IDP) of the LDM acknowledges the natural abundance of sunshine associated with the Free State Province to support solar energy projects. ▪ The following is stated in the 2019 - 2020 IDP for the MLM: o The MLM "is trying level best to decrease its carbon footprint thus moving towards green economy"; o There is "an increase of electricity as energy source". The number of people in the MLM's electricity network has increased. o There is a "lack of usage of alternative source of energy to fulfil our energy needs". ▪ Refer to **Section 11.10** below for a discussion on the SDF and planning aspects. ▪ An application for the change of land use has been submitted to the Free State Department of Agriculture and Rural Development.
2.	Should development, or if applicable, expansion of the town/area concerned in terms of this land use (associated with the activity being applied for) occur here at this point in time?	▪ The Project is located in a high solar yield area. ▪ The proposed location of the Solar PV Plant strongly depends on the flat and sparsely populated land, grid connection, water supply, good transport infrastructure and the availability of a large portion of municipal land. ▪ Eskom tariffs have increased and Solar PV capital costs decreased. Generating power via Solar PV is cheaper than pursuing electricity from Eskom.
3.	Does the community/area need the activity and the associated land use concerned (is it a societal priority)? This refers to the strategic as well as local level (e.g. development is a national priority, but within a specific local context it could be inappropriate)	▪ The proposed Project will be developed to serve the MLM's energy requirements. Refer to **Section 3** above for the Project's benefits to the MLM.

No.	Question	Response
4.	Are the necessary services with appropriate capacity currently available (at the time of application), or must additional capacity be created to cater for the development?	▪ Ideal location in terms of evacuating the energy via the Eskom grid. Grid showed that 900 MW can be injected in grid at Matjhabeng without any negative impact on the grid or stability. ▪ No upgrade or strengthening of grid needed. ▪ Existing Eskom substation are used to connect to the grid and evacuate energy ▪ The services required for the development are explained in **Section 9.10** below.
5.	Is this development provided for in the infrastructure planning of the municipality, and if not what will the implication be on the infrastructure planning of the municipality (priority and placement of services)?	▪ The MLM's Council has formally classified this Project as an EEPP (refer to **Section 3** above).
6.	Is this project part of a national programme to address an issue of national concern or importance?	▪ SA's commitment to renewable energy is reflected in its ratification of the Paris Agreement and the country's long-term energy planning iterations. ▪ Solar power represents a large component of the needed diversification of SA's electricity system. ▪ According to the Department of Energy (2017), energy is by nature an intergovernmental issue, cutting across energy security, economic prosperity, employment and environment, among others. In recognising these benefits, clean energy has been incorporated into the broader policy framework. ▪ The White Paper on Renewable Energy of 2003 is one of SA's policy documents that laid the foundation for the promotion of renewable energy technologies such as solar, hydro, biomass and wind (http://www.energy.gov.za/files/renewables_frame.html). Through this policy document, a ten year target of how renewable energy technologies could diversify the country's energy mix and secure cleaner energy was set. ▪ Ministerial determination has confirmed that this project is part of the long term energy mix and a suitable substitute for coal fired energy. ▪ This Project supports SIP 8: Green energy in support of SA's economy. ▪ The Applicant intends to bid for the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP).
DESIRABILITY ('placing')		
7.	Is the development the best practicable environmental option (BPEO) for this land/site?	▪ Refer to **Section 14** for the selected BPEO for the Project alternatives.
8.	Would the approval of this application compromise the integrity of the existing approved municipal IDP and SDF as agreed to by the relevant authorities?	▪ It is not anticipated that the proposed project will contradict or be in conflict with the municipal IDPs and SDFs (refer to response provided above to item no. 1).

No.	Question	Response
9.	Would the approval of this application compromise the integrity of the existing environmental management priorities for the area (e.g. as defined in EMFs), and if so, can it be justified in terms of sustainability considerations?	▪ The compatibility of the Project with the Free State Biodiversity Plan (2015), including Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs). and other environmental management and planning tools, were considered as part of the Terrestrial Ecology Assessment (refer to **Section 11.8.1** below).
10.	Do location factors favour this land use (associated with the activity applied for) at this place? (this relates to the contextualisation of the proposed land use on this site within its broader context).	▪ The rationale for the Project is based on its geographic location and the value it provides to MLM and users of electricity/energy. ▪ The site is also located close to the main Eskom transmission grid that links the major centres in South Africa. ▪ The specialist studies further investigated the location based on sensitive environmental features and receptors. Refer to the findings of the specialist studies contained in **Section 12** below. ▪ Refer to response provided above to item no. 2.
11.	How will the activity or the land use associated with the activity applied for, impact on sensitive natural and cultural areas (built and rural/natural environment)?	▪ See compilation of significant environmental issues associated with the proposed Project contained in **Section 13.6** below. ▪ Refer to **Section 14** below, which discusses how the layouts for Phase 1 and Phase 2 incorporated the findings of the specialist studies.
12.	How will the development impact on people's health and wellbeing (e.g. in terms of noise, odours, visual character and sense of place, etc.)?	
13	Will the proposed activity or the land use associated with the activity applied for, result in unacceptable opportunity costs?	▪ Opportunity costs are associated with the net benefits forgone for the development alternative. ▪ The affected land is rural in nature and was previously used for mining purposes. ▪ As mentioned, the proposed Project Sites have been secured and the MLM has entered into a Long-Term Land Lease Agreement with the Applicant. ▪ As noted in **Section 5.2.4** above, although there is an existing mining right by Harmony Gold Mining Company Ltd on the area in question, a consent letter was received from the mining company. In addition, no objections were raised by DMRE against the proposed Project (refer to letters received from DMRE and Harmony Gold Mining Company Ltd contained in **Appendix G**). ▪ According to Lanz (2015), the agricultural potential varies across the sites due to the different soils. Those parts that have been cultivated in the past are likely to have higher agricultural potential and therefore to have higher agricultural sensitivity to development. ▪ The specialist studies (**Section 12** below) assisted in determining whether the opportunity costs will be unacceptable.
14	Will the proposed land use result in unacceptable cumulative impacts?	Cumulative impacts are considered in **Section 13.27** below.

9 PROJECT DESCRIPTION

9.1 Overview of Technical Details

The technical details of the proposed facility are captured in **Table 9** below.

Table 9: Technical details of the proposed facility

No.	Component	Description / Dimensions
1.	Height of PV panels	Approximately 2m
2.	Area of PV Array	Approximately 650Ha per phase
3.	Number of inverters required	Approximately 1100 (based on 185kVA inverters) per phase, 2200 in total
4.	Area occupied by inverter / transformer stations / substations	Approximately 2Ha per phase
5.	Capacity of on-site substation	200MW per phase
6.	Area occupied by both permanent and construction laydown areas	1Ha per phase
7.	Area occupied by buildings	Approximately 2000m² per phase
8.	Length of internal roads	Approximately 25km per phase
9.	Width of internal roads	The internal roads will vary from 4m to 7m wide and will be gravel. The entrance road will exceed 7m, most likely 7.4m wide.
10.	Proximity to grid connection	▪ **Phase 1**: o From the on-site Substation Option 1 the distance to the existing Eskom Euclid Substation is approximately 3.5 km, and from Substation Option 2 the distance is approximately 4.3 km. ▪ **Phase 2**: o Northern block – from the on-site substation the distance to the existing Eskom Grootkop Substation is approximately 14.1 km. o Western blocks – from the on-site Substation Option 1 the distance to the existing Eskom Grootkop Substation is approximately 17.3 km, and from Substation Option 2 the distance is approximately 16.9 km. o South-eastern block – from the on-site substation the distance to the existing Eskom Geduld Substation is approximately 2.4 km for Power Line Option 1, and approximately 4.2 km for Power Line Option 2.
11.	Height of fencing	2.4m
12.	Type of fencing	Type will vary around the site, welded mesh, palisade and electric fencing.
13.	BESS Infrastructure	The facility size for each phase of 40MW/ 160MWh storage will be approximately 60 units each sized at 7m length x 1.6m width x 2.5m high. Level and fenced off platforms would be created for the battery storage areas of approximately 2 000m². The location of the battery energy storage facility will be adjacent to the 132/33kV solar farm's on-site substations.

9.2 Solar Technology

Solar energy facilities operate by converting solar energy into a useful form (i.e. electricity). The use of solar energy for electricity generation is a non-consumptive use of a natural resource and consumes no fuel for continuing operation. Solar power produces an insignificant quantity of greenhouse gases over its lifecycle as compared to conventional coal-fired power stations. The operational phase of a solar facility does not produce carbon dioxide, sulphur dioxide, mercury, particulates, or any other type of air pollution, as fossil fuel power generation technologies do.

9.3 Photovoltaic

PV technology produces direct current (DC) which is then converted to alternating current (AC) via power electronic inverters. The main technology categories are crystalline modules (mono or poly), thin film, and concentrated photovoltaics (CPV). **Figure 10** below provides an overview of Solar PV Power Plant.

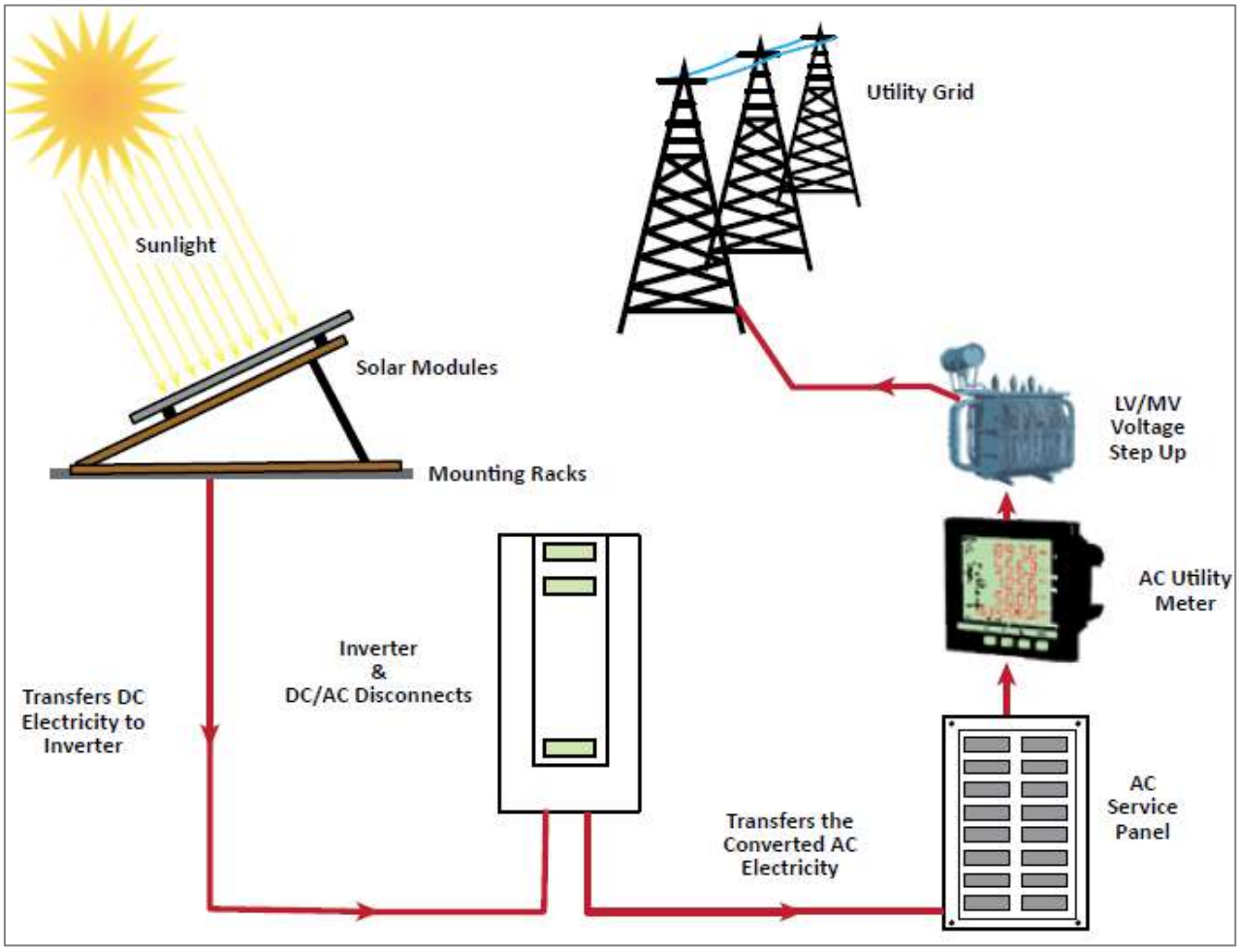


Figure 10: Overview of Solar PV Power Plant (IFC, 2015)

9.4 Project Layout

The desirability of the proposed Phase 1 and Phase 2 Sites for the development of the proposed Solar Park is due to the following key characteristics:

- **Solar Radiation**: The feasibility of a solar facility especially a Solar Park of this magnitude is dependent on the direct solar irradiation levels (refer to **Figure 2** above).
- **Topography**: The suitability of the surface area is an important characteristic for the construction and operation of solar facilities. It was found that the majority of the site has a slope of less than 2% and can therefore be considered as suitable for most technologies. **Table 10** below indicates the solar technology slope requirements.

Table 10: Solar Technology Slope Requirements

Technology	Slope requirement (%)
PV Fixed	< 10% for north facing slope
	<5% in all other directions
PV tracking	<8%
CPV	<5%

- **Power and transmission considerations**: The electricity generated by the Solar PV Plant will be injected into the existing Eskom 132 kV distribution system (refer to **Section 9.7** below). The Phase 1 and Phase 2 Sites are located close to the main Eskom transmission grid that links the major centres in South Africa.
- **Extent of site**: The overall extent of the sites is sufficient for the installation of the PV facility, and allows for the avoidance of site sensitivities.
- **Site access and road infrastructure**: The site can be accessed via the R30 (to the west of the site) and R34 (access to the north and western section of Phase 1 Site) and can also be accessed via other secondary roads.
- **Availability of land**: The proposed Project Sites have been secured and the MLM has entered into a Long-Term Land Lease Agreement with the Applicant. The proposed land satisfies this planning requirements.

The layouts of the Phase 1 and Phase 2 Sites are shown in **Figure 11** and **Figure 12** below.

The following factors were considered in determining the layouts (amongst others):

- Requirements of the PV Plant;
- Findings from previous studies (including Feasibility Study, Geotechnical Investigation and Solar Resource Assessment);
- Watercourses;
- Existing servitudes and infrastructure; and
- Exclusion zones associated with defunct mining areas.

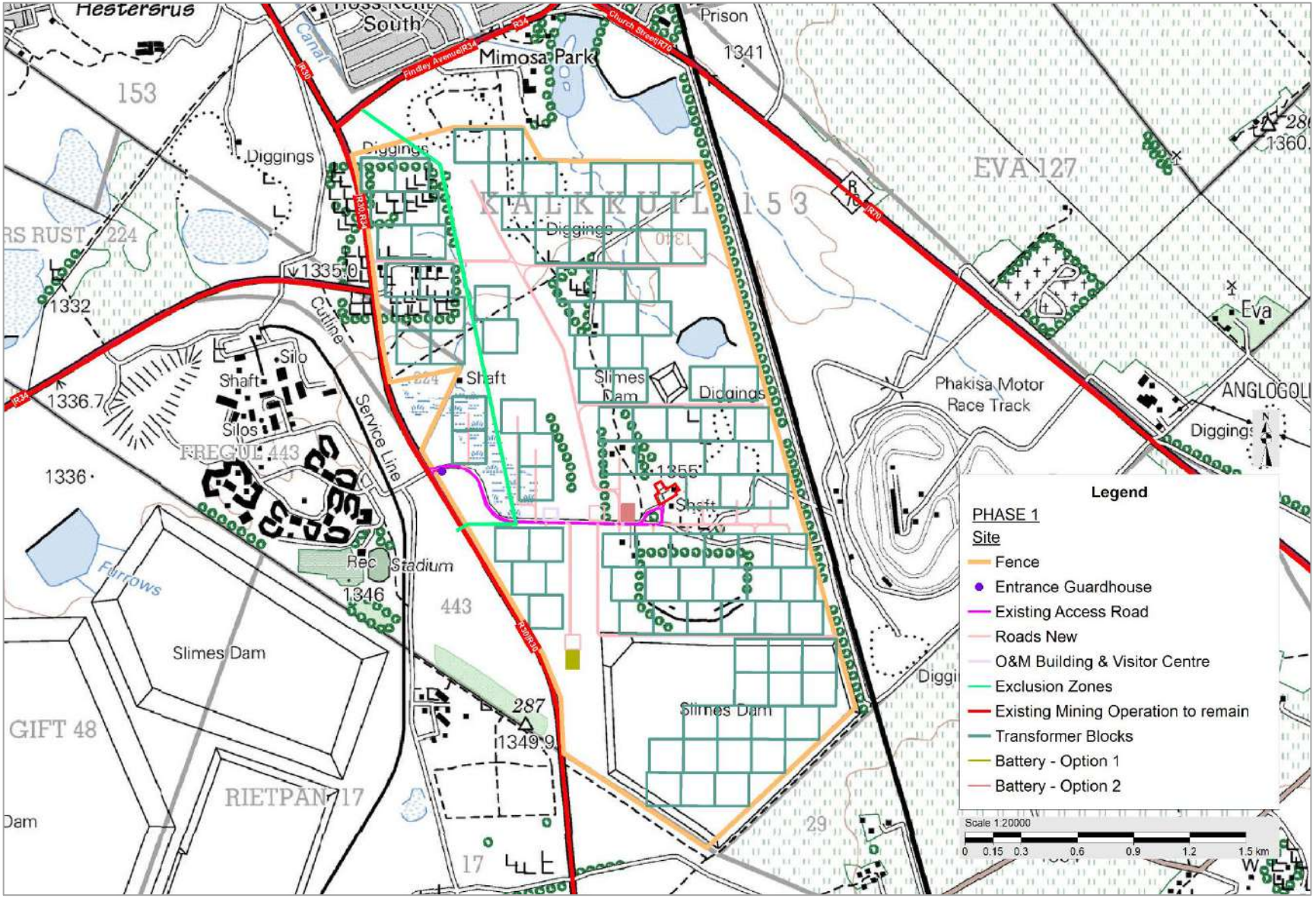


Figure 11: Phase 1 Site Layout

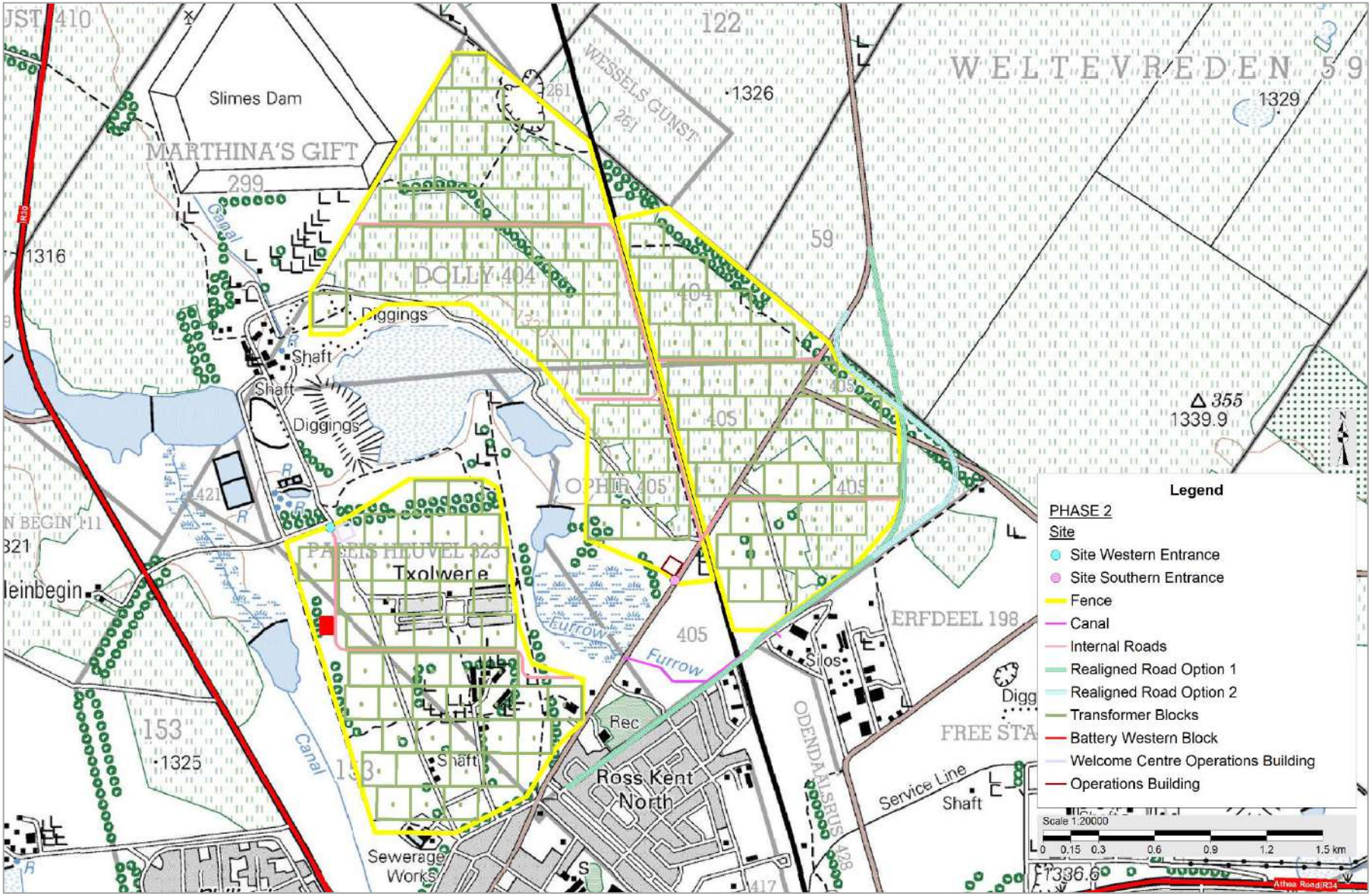


Figure 12: Phase 2 Site layout

9.5 Components of the Proposed Solar PV Facility

The components of the proposed Solar PV Facility are discussed below.

9.5.1 Solar PV Panels/Modules

Solar PV modules to be utilised on this Project are typically silicon wafers in a glass encapsulated module with typical dimensions of 2m x 1m per module.

The purpose of the PV modules is to convert solar energy into direct current (DC) electrical power. Modules will be connected with cables looped from junction boxes on the underside of the module from one module to the next. For solar farms operating up to 1500V DC the typical number of modules connected in series to form a string will be 28. The modules are arranged on a tracker in north south rows with typically 3 strings per tracker. The length of the row in a north/south direction is thus typically 3 x 28 x 1m = 84m.

PV plants (including mono-crystalline, poly-crystalline and thin film) can be of any size and their layouts can be flexible, as the systems are modular and the PV modules can be arranged to fit within most footprints, even if the land shape is not rectangular.

9.5.2 Single Axis Trackers

The purpose of the single axis tracker is to keep the modules facing the sun, tracking from east to west. Single axis trackers are typically spaced 5m apart but could be spaced further apart where space permits to reduce shading from one row to the next in the early morning and late afternoon. An example of PV modules mounted on single axis trackers is shown in **Figure 13** below.

Figure 13: Example of Rows of PV Modules Mounted on Single Axis Trackers from PIA Solar

The trackers are mounted on steel posts installed in the ground. Concrete bases are sometimes also used.

The site would need to be cleared of all trees to prevent shading of the PV modules. The ground between the trackers is sometimes left grassed.

9.5.3 Inverters

Inverters are installed to convert the DC electrical power into Alternating Current (AC) electrical power which is used in the grid. The frequency of the AC electricity is synchronised to the grid, in South Africa 50Hz, but varies slightly. The purpose of the inverters is to maximise and control the conversion of power from the DC modules to low voltage AC i.e. less than 1000V.

String inverters have multiple inputs for connecting the strings from the trackers. String inverters are normally installed on steel structures under the shade of the PV modules.

9.5.4 Low Voltage AC Cabling

AC Cables are installed from the inverters to the distribution box located adjacent to the medium voltage transformers. These cables are installed underground in trenches.

9.5.5 Medium Voltage Step-Up Transformers

The purpose of medium voltage transformers is to step-up the low voltage to medium voltage. In order to distribute the combined electrical power from a block of tracker rows the voltage is required to be increased. Transformers will typically be in the order of 2.5MVA capacity and similar in appearance to the type as shown in **Figure 14** below.

Figure 14: Example of Medium Voltage Transformer and Distribution Box
(Photo from Actom Brochure)

Transformers will typically be filled with oil for cooling the transformer windings. The cooling oil is circulated through radiator fins mounted on the side of the transformer. The oil remains in the transformer. Oil spills from transformers need to be contained by providing drip trays and special care taken to clean up the spill should it occur.

9.5.6 Medium Voltage AC Cabling

Medium voltage AC cabling from the transformers to the high voltage substations is buried in trenches underground. The cables are protected from accidental damage by placing brightly coloured orange danger tape in the trench and sometimes concrete slabs. Cable routes are indicated with concrete cables markers on the ground at bend points, road crossings etc.

9.5.7 High Voltage Substations

The medium voltage cables are connected to a medium voltage switchgear room located in a substation yard. High voltage transformers step the medium voltage up to high voltage.

Figure 15: Example of High Voltage Substation

A typical HV Substation will look like the substation shown in **Figure 15** above, with large ground mounted transformers and outdoor high voltage switchgear with overhead conductors and steel lattice structures. The yard is fenced off and only authorised personnel are allowed inside the high voltage yard (see example shown in **Figure 16** below).

Figure 16: Example of High Voltage Transformers

9.5.8 Guardhouses, Operation, Maintenance and Visitor Centre Buildings

Guardhouses, Operation, Maintenance and Visitor Centre Buildings are required for the facility. Buildings will be single story.

The purpose of the buildings is to provide space for staff working on site for the operation and maintenance of the facilities, including storage space for spare parts, tools, etc, Computers will be installed for monitoring the electricity generation and reporting on the condition of the plant. Toilets, kitchens, water, waste-water and electricity will be required for staff and visitors.

Sustainable building principals will be used including use of rain-water harvesting, energy efficient lighting, insulation, etc.

9.5.9 Roads

Existing roads are located on the sites. These will serve as the entrance roads to the sites. Existing access from main roads will remain as is. The internal roads will vary from 4m to 7m wide and will be gravel, with the exception of paving close to the buildings for parking and access into the buildings. The entrance road will exceed 7m, most likely 7.4m wide.

It is proposed to realign the A48 / S86 road that crosses the western part of the Phase 2 Site to maximise the space available on the property to install solar tracker rows and enable the solar farm to be fenced off and secured. The A48 / S86 road is a gravel road and changes to a surfaced, tarred road on the property. It is proposed to close the existing section of the A48 / S86 road over the site and to deviate traffic to Frank Street and for the A48 / S86 road to run to the south east of the site. Two options are proposed to realign the road, as shown in **Figure 17** below.

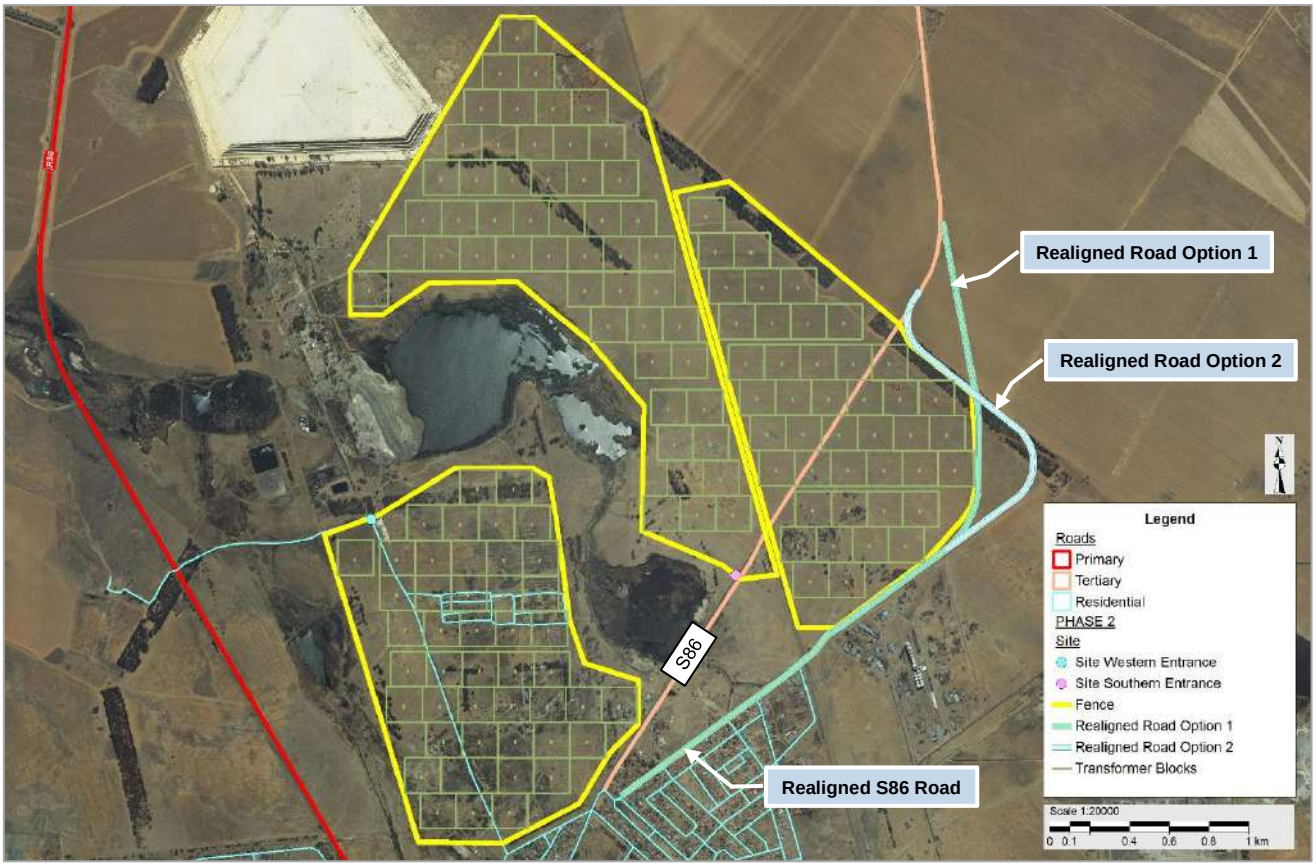


Figure 17: **Realignment options for the A48 / S86 road**

The basic layout consists of rows of single axis trackers, similar to that shown in **Figure 18** below with transformers in shipping containers (white blocks in photograph) or mounted on a concrete plinth on the ground. **Figure 18** below shows typical roads within the site.

Figure 18: **Example of Roads Between Trackers and Medium Voltage Substations**
(Photo from PIA Solar)

9.5.10 Fencing, Security and Lighting

Fencing around each Phase is required to secure the site. Due to the voltage of the DC wiring, up to 1500V and high value of the plant the site must be secured. Details of the fencing is still to be finalised and may include electric fencing.

CCTV cameras and security lighting may be installed as part of the security for the plant.

9.5.11 Stormwater Infrastructure

The topography of the two sites (Phase 1 Site and the Phase 2 Site) is relatively flat. Over most of the sites the ground surface slopes are less than 2 %. Existing watercourses traverse the sites. The relative flatness of the sites makes the management of stormwater runoff not too difficult as high velocities in surface drainage channels and pipes underground drainage systems need not be dealt with. Furthermore, surface stormwater drainage channels can be employed to advantage (easier to maintain than an underground pipe system).

Due to the sizes of the two sites (approximately 600 ha each), stormwater attenuation can be considered as a means of reducing the post development discharge volumes to lesser discharge volumes. To this end, the feasibility of providing stormwater attenuation dams with suitable inflow/outflow characteristics will be investigated during the design phase.

Access and internal roads will be provided as part of the required infrastructure. It is assumed access roads will be tarred and that other roads servicing the plant and solar PV panels will be gravelled. The access and internal roads will be formed with a crossfall towards the higher side of the topography. Stormwater will be allowed to flow into drainage channels adjacent and parallel to the road. Where necessary, drainage channels will discharge into an underground pipe system. All storm runoff will be safely discharged into the natural environment. Energy dissipators will be provided at the stormwater drainage system outlets to mitigate the negative impacts of concentrated discharges into the environment.

Where it is required that storm runoff cross roads, low level causeways (that can be negotiated by vehicular traffic) or suitably sized culverts passing below the road will be provided.

Existing watercourses traverse the two sites. Should it be necessary, flood lines will have to be calculated for the watercourses. Flood lines will be calculated for a range of storm return periods (at least the 50 and 100 year return period storm event). Flood lines will be calculated with the standard HECRAS software.

9.6 Battery Energy Storage System

9.6.1 Types of Electrical Energy Storage Systems

Electrical Energy storage systems consist of Mechanical, Chemical, Electrical, Thermal and Electrochemical systems. **Figure 19** below summarizes the various Electrical Energy Storage systems. The Electrochemical/battery storage system was selected as the preferred solution to meet the requirements of the Project. The BESS can be broken into solid state and flow battery systems, as explained below.

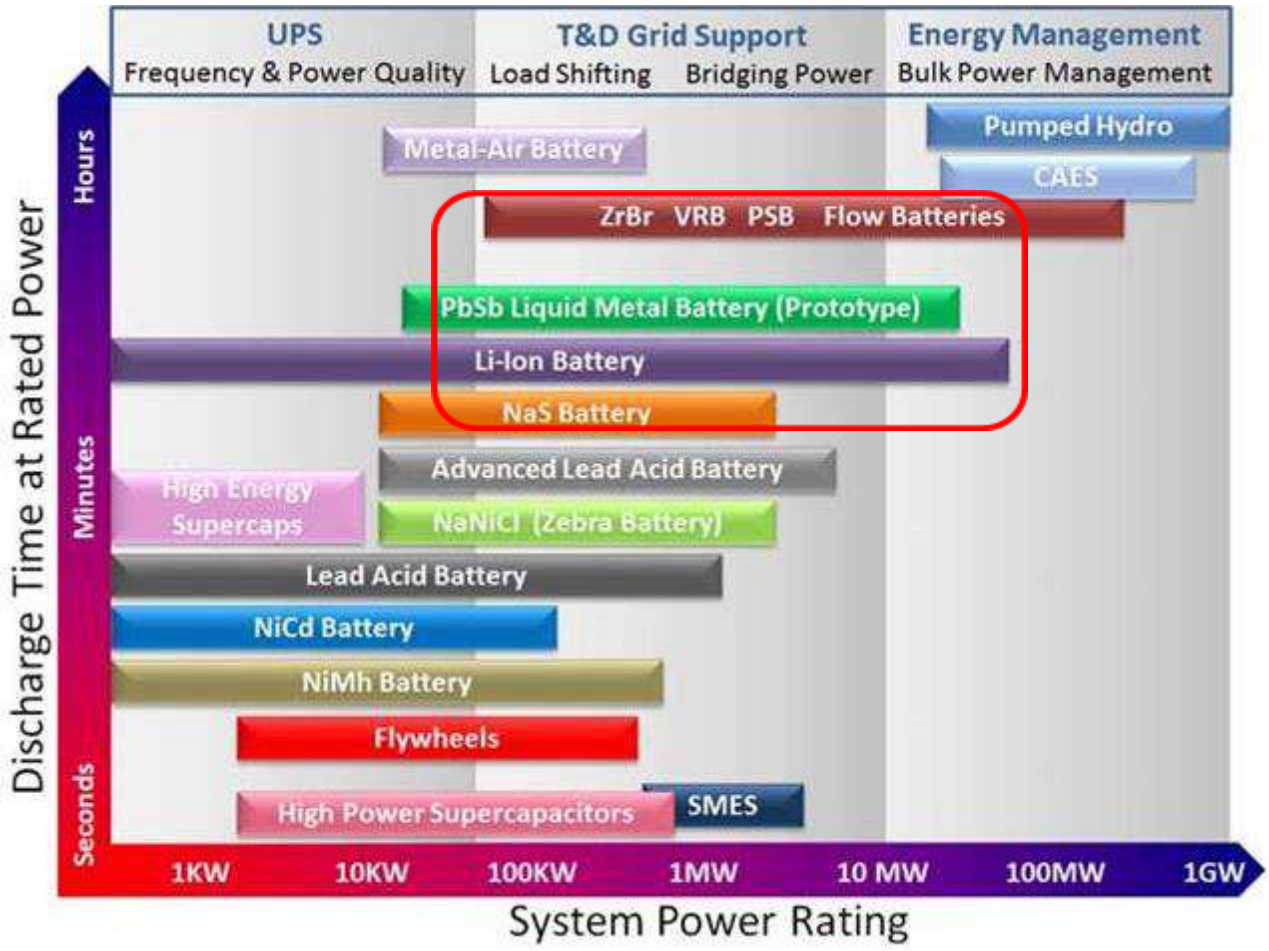


Figure 19: Grid Energy Storage Technologies and Applications

9.6.1.1 Solid State Battery Systems

Solid state batteries consist of lithium-ion, lead acid etc. lithium-ion is used extensively in the Electrical Energy Storage systems. Current estimates indicate that approximately 85% of the electrochemical systems installed use lithium ion batteries. “Lithium-ion” refers to a wide array of chemistries in which lithium-ions are transferred between the electrodes during the charge and discharge reactions. The construction/composition of the lithium-ion battery varies from manufacturer to manufacturer. Lithium-ion has the smallest installation footprint when compared to the technologies for the similar energy capacity.

9.6.1.2 Flow Battery Systems

Flow or redox flow battery is where chemical energy is provided by two chemical components dissolved in liquids contained within the system and separated by a membrane. Typical systems use Vanadium or Zinc Bromine, which are further explained below:

- The vanadium redox battery (VRB), also known as the vanadium flow battery (VFB) is a rechargeable flow battery that employs vanadium ions in different oxidation states to store chemical potential energy. The battery consists of an assembly of cells in which the two electrolytes are separated by a proton exchange membrane; both half-cells are additionally connected to storage tanks and pumps so that the electrolytes can be circulated through the cell. The main advantages of the VRB are that it can offer almost unlimited energy capacity simply by using larger electrolyte storage tanks; it can be left completely discharged for long periods with no ill effects; if the electrolytes are accidentally mixed, the battery suffers no permanent damage; a single state of charge between the two electrolytes avoids the capacity degradation due to a single cell in non-flow batteries; the electrolyte is aqueous and inherently safe and non-flammable. The main disadvantage with vanadium redox technology is a relatively poor energy-to-volume ratio.
- Zinc Bromine flow battery uses a solution of Zinc bromide stored in two tanks the electrolyte is pumped from one tank to the other tank during the charging and discharging process. The advantages and disadvantages listed for the vanadium redox is applicable to the Zinc bromine flow battery.
- Sodium-Sulphur (NaS) battery system is also an energy storage system based on electrochemical charge/discharge reactions that occur between a positive electrode (cathode) that is typically made of molten Sulphur (S) and Sodium (Na). The NaS battery has the general advantages as for the Vanadium and Zinc bromine i.e. long life, high number of charge and discharge cycle, ability to discharge fully with no effects to the performance. The disadvantage is the low energy to size ratio.

9.6.2 The Project's BESS Infrastructure

The total capacity of the Project is 80 MW (320 MWh) of BESS. Each Phase will be of 40 MW (160 MWh). The technology is commercially proven solid state battery systems. The main battery suppliers in the world who have a total market share of 85% are Tesla, CATL, Fluence and Samsung.

This type of technology is widely used in mobile phones and electric vehicles. It is also predominantly used in large utility scale projects. The batteries are contained in specially manufactured shipping containers that are vandal proof and have an IP rating of 66 or more.

The number of battery containers will vary depending on the energy density of the selected battery chemistry. The facility size for each phase of 40MW/ 160MWh battery storage will be approximately 60 units each sized at 7m length x 1.6m width x 2.5m high (these are typical figures of the number of containers for lithium batteries to achieve a battery size of 160MWh on each phase). Level and fenced off platforms would be created for the battery storage areas of approximately 2 000m². The location of the battery energy storage facility will be adjacent to the 132/33kV solar farm's on-site substations.

Examples of similar utility scale BESS are shown in **Figure 20** below. One of the options being considered is the Tesla Megapack. Every Megapack arrives pre-assembled and pre-tested in one enclosure, including battery modules, bi-directional inverters, a thermal management system, an AC main breaker and controls (https://www.tesla.com/en_za/megapack).

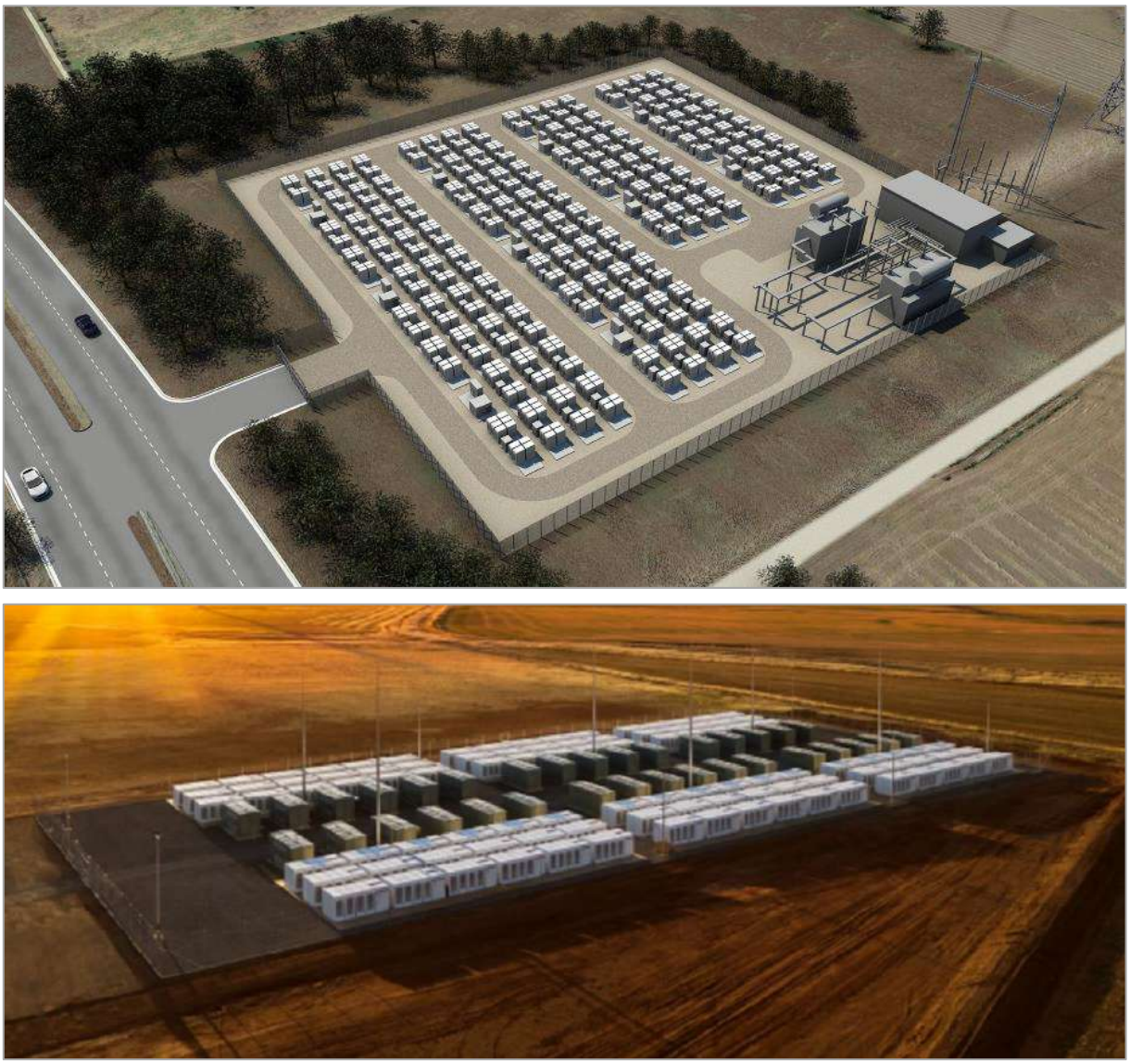


Figure 20: Examples of BESS installations (South Australia)

The containers are environmentally friendly during their life-cycle. However, the Lithium in this technology is considered hazardous / dangerous goods. Used batteries will be removed by the suppliers. Batteries containing chemistries that when charged are a fire risk and at the end of their life need to be recycled. The battery chemistry is not finalised yet but could contain lithium, iron, phosphate, nickel, manganese, cobalt, sodium or sulfur. With regard to the fire risk, the battery storage area will have a non-flammable buffer area to prevent the spread of fire. The battery energy storage system will have electrical and fire protection measures in the form of battery temperature monitoring, circuit breakers, fire detection and fire suppression as per fire and electrical regulations.

9.7 Grid Connection

As mentioned, a separate EIA will be undertaken for the proposed power lines, as was agreed to with DFFE during the pre-application meeting held for the Project. An overview of the proposed grid connection is provided below.

A Network Integration Study was undertaken to investigate the integration of the proposed Solar PV Plant into the Eskom electrical network. Two sub-transmission integration options per plant were identified and assessed, based on technical, operational and economic factors in order to determine the preferred option. The results showed that the Eskom grid has sufficient spare capacity to absorb the phases of the Project.

Based on the findings of the abovementioned study, as well as the progression of the technical design of the Project, the electricity generated by the Solar PV Plant will be injected into the existing Eskom 132 kV distribution system as follows:

- **Phase 1** (refer to **Figure 21** below):
  - New 132kV power lines between the on-site substation and the existing Eskom Euclid Substation located to the south-east of the Phase 1 Site. From the on-site Substation Option 1 the distance is approximately 3.5 km, and from Substation Option 2 the distance is approximately 4.3 km.
- **Phase 2** (refer to **Figure 22** below):
  - **Northern block** – new 132kV power line between the on-site substation and the existing Eskom Grootkop Substation located to the north of the Phase 2 Site. From the on-site substation the distance is approximately 14.1 km.
  - **Western block** – new 132kV power line between the on-site substation and the existing Eskom Grootkop Substation located to the north of the Phase 2 Site. From the on-site Substation Option 1 the distance is approximately 17.3 km, and from Substation Option 2 the distance is approximately 16.9 km
  - **South-eastern block** – new 132kV power line between the on-site substation and the existing Eskom Geduld Substation located to the south-east of the Phase 2 Site. From the on-site substation the distance is approximately 2.4 km for Power Line Option 1, and approximately 4.2 km for Power Line Option 2.

The Project's proposed power lines will generally run parallel to or within existing 44kV servitudes. There are some options where transmission lines will run separately from the existing 44kV lines.

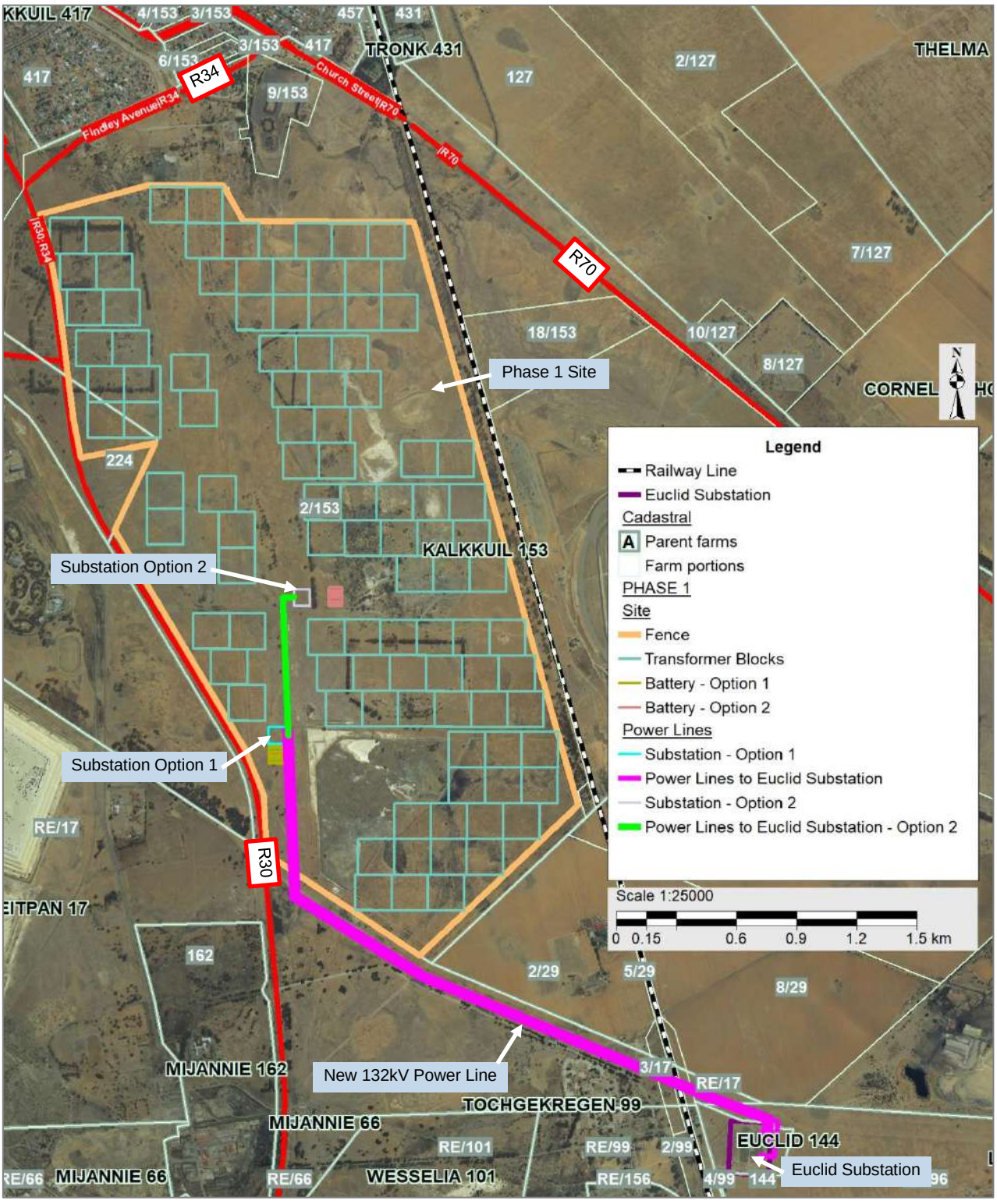


Figure 21: Proposed Phase 1 Power Line Routes
(Note: not all components of the Phase 1 PV Facility are shown)

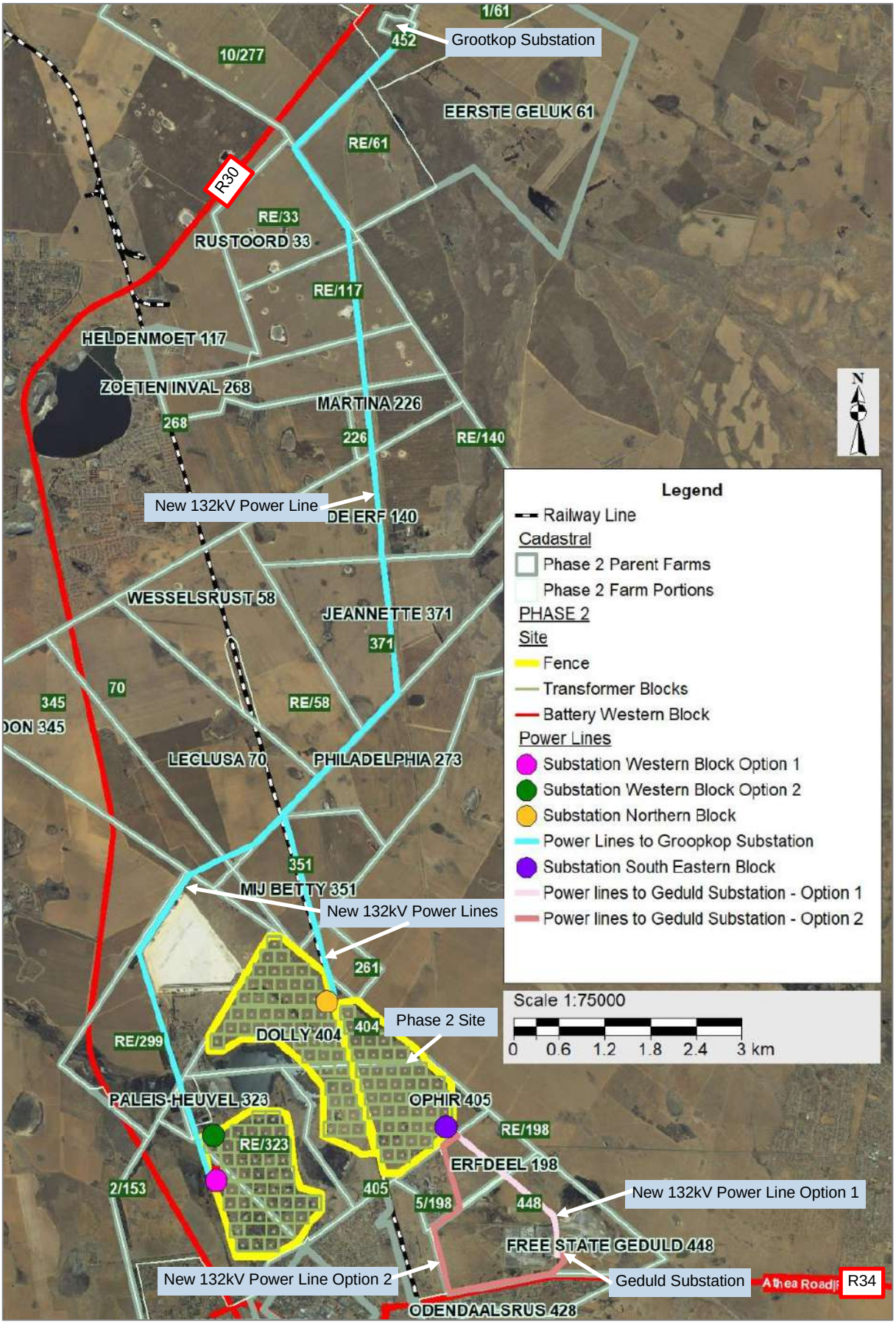


Figure 22: Proposed Phase 2 Power Line Routes
(Note: not all components of the Phase 2 PV Facility are shown)

An example of high voltage transmission line connecting to a substation is provided in **Figure 23** below.

Figure 23: Example of High Voltage Transmission Line Connecting to Substation

9.8 Project Life-Cycle

The project life-cycle for a new Solar PV Plant includes the following primary activities (high level outline only):

- Feasibility phase - This phase includes confirming the feasibility of the Project by evaluating and addressing the following (amongst others) –
  - Solar resource assessment;
  - Site selection;
  - Project land allocation;
  - Project yield assessment;
  - Permitting and licensing;
  - Legal agreements;
  - Socio economic development;
  - Industrialisation and localisation;
  - Project cost determination;
  - Project financing; and
  - Risk analysis.

- Design phase - This phase includes the following (amongst others) –
  - Confirming key design features such as the type of PV module to be used, tilting angle, mounting and tracking systems, inverters, and module arrangement;
  - Confirming specifications for the components of the Solar PV Plant and BESS;
  - Preparing detailed designs (layout, civil, electrical) for the Phase 1 and Phase 2 Sites;
  - Preparing construction plans;
  - Preparing the Project schedule; and
  - Preparing the commissioning plans.
- Construction phase – During the implementation of the project, the following construction activities will be undertaken –
  - Establishing access roads;
  - Preparing the site (fencing, clearing, levelling and grading, etc.);
  - Establishing the site office;
  - Establishing laydown areas and storage facilities;
  - Transporting equipment to site;
  - Undertaking civil, mechanical and electrical work; and
  - Reinstating and rehabilitating working areas outside of permanent development footprint.
- Operational phase - Once the solar park is up and running the facility will be largely self-sufficient. Operational activities associated with the maintenance and control of the Solar PV Plant will include the following (amongst others) –
  - Testing and commissioning the facility's components;
  - Cleaning of PV modules;
  - Controlling vegetation;
  - Managing stormwater and waste;
  - Conducting preventative and corrective maintenance; and
  - Monitoring of the facility's performance.
- Decommissioning - Solar PV Plants are likely to have an operational lifetime of 20 to 25 years or more. The most likely scenario would be extension of the lifespan of the solar facilities by means of replacing individual components with newer more appropriate technology available at that time. The decommissioning phase will include measures for complying with the prevailing regulatory requirements, rehabilitation and managing environmental impacts in order to render the affected area suitable for future desirable use.

9.9 Implementation Programme

Key milestones during the Project's implementation programme include the following:

- Financial Close: 30 November 2020.
- Phase 1 –
  - Notice to proceed (commencement of construction): 15 December 2020; and

- Commercial Operation Date (COD): 28 February 2022.

❖ Phase 2 –

- Notice to proceed (commencement of construction): 1 September 2022; and
- COD: 30 November 2023.

9.10 Resources and Services required for Construction and Operation

This section briefly outlines the resources that will be required to execute the Project. Note that provision is made in the EMPr to manage impacts associated with aspects listed below, as relevant.

9.10.1 Raw Materials

Construction

Material required for construction purposes, including fencing and construction material (e.g. cement, sand, aggregate, etc.), will be sourced from suitable suppliers. The PV modules and other components of the facility will also be sourced from accredited suppliers.

Operation

During the operational phase, few raw materials will be required. Material such as consumable spares will be used for the operation of the facility.

9.10.2 Water

Construction

During construction, the Contractor will require water for potable use by construction workers and water will also be used in the construction of the foundations and other components of the Project. The necessary negotiations will be undertaken with the MLM or landowners to obtain water from approved sources.

Operation

Water use requirements for a Solar PV Plant during the operational phase depends on the technology and climate conditions at the site. In general, solar power technologies use relatively low volumes water for cleaning solar collection and reflection surfaces like PV panels, as well as for domestic consumption by the staff.

Water will be supplied by the MLM, with water connections to the Phase 1 and Phase 2 Sites.

9.10.3 Sanitation

Construction

Sanitation services will be required for construction workers in the form of chemical toilets, which will be serviced at regular intervals by the supplier.

Operation

Sewage from the buildings and toilets across the site will be discharged into various septic tank systems. The soakaway systems will be designed with sufficient spare capacity to accommodate the possibility of excessive usage above the anticipated average. This option is by far the most cost effective system for this Project. It is to be considered that a well-constructed and maintained septic tank should be odourless and problem free.

Should the receiving environment be regarded as sensitive, then the use of honey sucker services from an independent contractor will be considered.

9.10.4 Waste

Construction

Solid waste generated during the construction phase will be temporarily stored at suitable locations (e.g. at the construction camp) and will be removed at regular intervals and disposed of at approved waste disposal sites. According to the 2019 - 2020 IDP for the MLM, there are four permitted municipal landfill sites. All the waste disposed of will be recorded.

Wastewater, which refers to any water adversely affected in quality through construction-related activities and human influence, will include the following:

- Sewage;
- Water used for washing purposes (e.g. equipment, staff); and
- Drainage over contaminated areas (e.g. workshop, equipment storage areas).

Suitable measures will be implemented to manage all wastewater generated during the construction period.

Operation

Refuse generated during the operational phase will be removed on a weekly basis and will be disposed of at a permitted waste disposal facility.

Used batteries will be removed by the suppliers.

9.10.5 Roads

Construction

Temporary access roads will be created during the construction phase. The areas affected by temporary roads will be reinstated, is they are not be used permanently in the operational phase.

Operation

As shown in **Figure 24** below, both the Phase 1 and Phase 2 sites are accessible from the north and south by the R30 arterial road and from the east and west via the R34 arterial road.

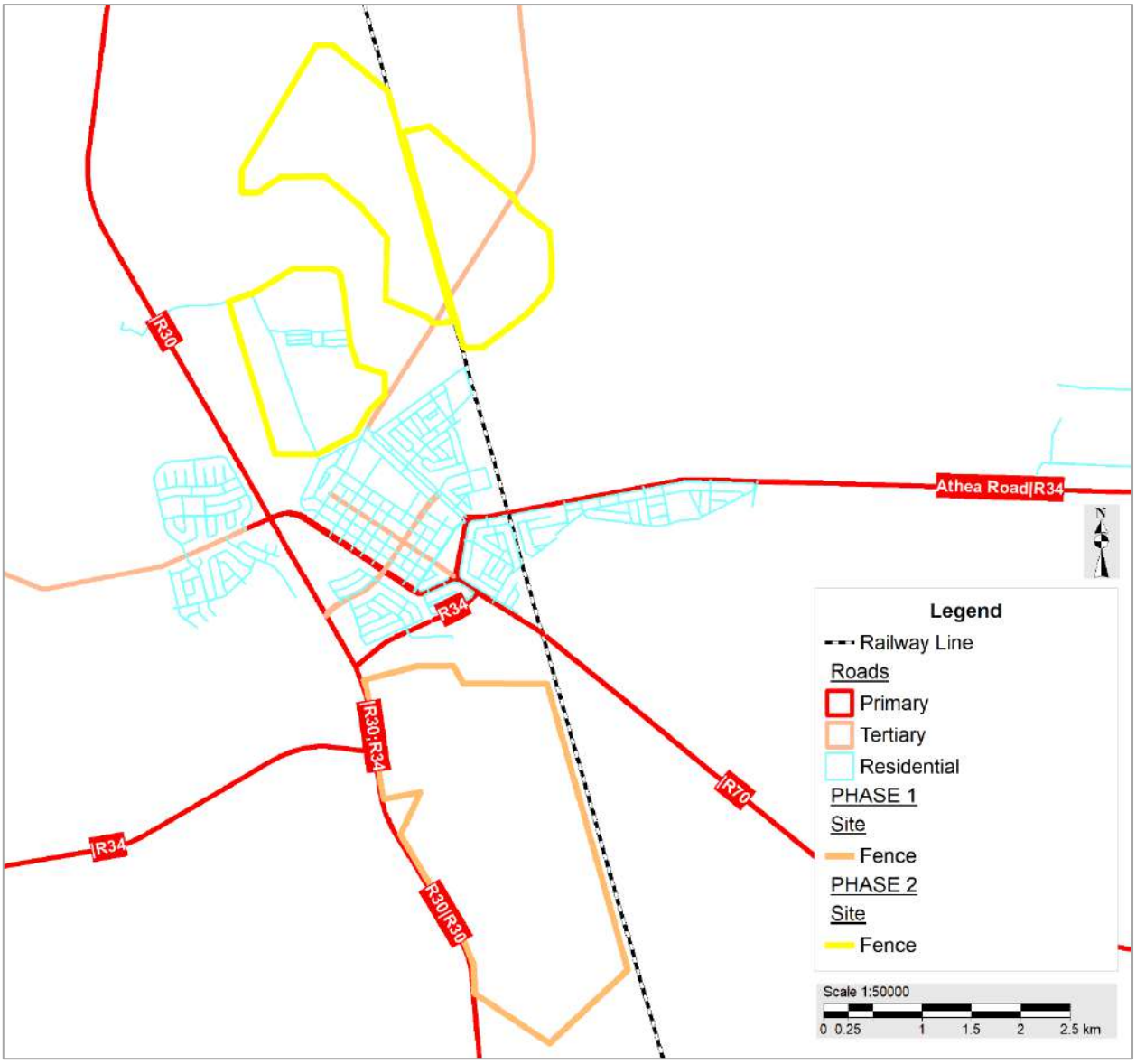


Figure 24: Road network surrounding the Phase 1 and Phase 2 Sites

9.10.6 Stormwater

Construction

Best environmental practices will be implemented during construction to manage stormwater.

Operation

The stormwater run-off along the main access road will be controlled by side swales and dispersed in a controlled manner at regular intervals. Stormwater run-off from the buildings will be disposed of through soakaways. A formal piped stormwater system is not envisaged for the wider site. Water will be managed on the surface and dispersed into natural drainage routes.

Separation of clean water from dirty water shall be implemented using the capturing of the first 5 minutes of rainwater into the holding dam and the rest being allowed to drain into the natural watercourses.

9.10.7 Electricity

Construction

The EPC Contractor will be responsible for the supply of electricity during construction. The electricity supply will be obtained from diesel generators and / or temporary supply via cables from the site power grid.

Operation

The electricity will be supplied by the plant during daylight hours (off-peak times – 07:00 to 17:00). The BESS will supply electricity during night hours (peak times – 05:00 to 07:00 and 17:00 to 19:00). During other times electricity will be supplied from the power grid.

9.10.8 Laydown Areas

Construction

A laydown area will be required during the construction phase.

9.10.9 Construction Workers

Construction

The appointed Contractor will mostly make use of skilled labour for the construction of the facility and its associated infrastructure. In those instances where casual labour is required, the Applicant will request that such persons are sourced from local communities, as far as possible.

10 ALTERNATIVES

10.1 Introduction

Alternatives are the different ways in which the Project can be executed to ultimately achieve its objectives. Examples could include carrying out a different type of action, choosing an alternative location or adopting a different technology or design for the project.

The sub-sections to follow discuss the project alternatives considered during the EIA process. A detailed comparative analysis of feasible alternatives from environmental (including specialist input) and technical perspectives is provided in **Section 14** below.

10.2 Site Alternatives

No site alternatives are proposed for this Project, as the placement strongly depends on the flat and sparsely populated land, grid connection, water supply, good transport infrastructure and the availability of a large portion of municipal land. Refer to **Section 9.4** above for the factors that contribute towards the suitability of the proposed Phase 1 and Phase 2 Sites.

10.3 Layout / Design Alternatives

The extent of the site allows for the identification of layout/design alternatives to manage impacts to environmental sensitivity.

Specific design/layout alternatives that may be considered include:

- The layout and mounting of the PV panels;
- Alternative routes for the power lines/cabling, substations and access roads;
- Placement of temporary laydown areas; and
- Buildings and other associated infrastructure.

The space available at the two sites are adequate to position the facility and its associated infrastructure to avoid areas of sensitive environmental features.

Refer to **Section 14** below for a discussion on the layout alternatives considered.

10.4 Technology Alternatives

10.4.1 PV Technology

In PV technologies the sunlight photons are converted directly to electricity. Fixed and tracking crystalline PV, fixed thin film PV and CPV fall into the PV category. The proposed Project proposes to use tracking technology, and alternatives to this preferred technology will not be considered further.

Some of the benefits associated with this technology include its robustness, long lifetime, the equipment prices have drastically decreased the past 10 years, it is easy to maintain, it does not cause any emissions and no waste is generated.

10.4.2 BESS Technology

The BESS can be broken into solid state and flow battery systems. Refer to **Section 9.5.1** above for the advantages and disadvantages associated with the types of BESS. A single battery technology, or a combination of two or more technology alternatives, may be implemented for the Project.

10.5 No-Go Option

The “no-go option” is evaluated in **Section 13.26** below to understand the implications of the project not proceeding.

11 PROFILE OF THE RECEIVING ENVIRONMENT

11.1 General

This section provides a general description of the status quo of the receiving environment in the Project area. This serves to provide the context within which the EIA exercise was conducted. The study area includes the entire footprint of the Project components and related activities for the Phase 1 and Phase 2 Sites.

Where necessary, the regional context of the environmental features is also explained, with an ensuing focus on the local surrounding environment. The reader is referred to **Section 12** for more elaborate explanations of the specialist studies and their findings for specific environmental features.

This section allows for an appreciation of sensitive environmental features and possible receptors of the effects of the proposed Project. The potential impacts to the receiving environment are discussed further in **Section 13**.

11.2 Land Use & Land Cover

11.2.1 General

The Land Cover Map (shown on **Figure 25** below) indicates the large extent of rainfed agriculture (maize fields), mining activities and the populated or built-up land within the study area.

In terms of the 2013-14 South African National Land-Cover dataset, the Phase 1 Site is mostly dominated by urban township and mines. The Phase 2 Site is dominated by cultivated fields in the north, grassland in the centre; some cultivation, plantations and mines with the rest mostly in the south dominated by urban township. Located in the middle of the two sites is the town Odendaalsrus which is dominantly classified as an Urban Village with open trees and bush. Remaining natural land cover types include mainly grassland, low shrubland, pans and limited thicket/dense bushland along the Sandspruit. Some scattered woodland areas also occur, and some planted trees and shrubs (mainly wind breaks) are also shown (MetroGIS, 2015).

Views of the Phase 1 and Phase 2 Sites, showing areas that are vacant and not affected by previous mining activities, are provided in **Figure 26** and **Figure 27** below, respectively.

Further details of the agricultural land use in the project area are contained in the Agricultural Impact Assessment (contained in **Appendix H4**).

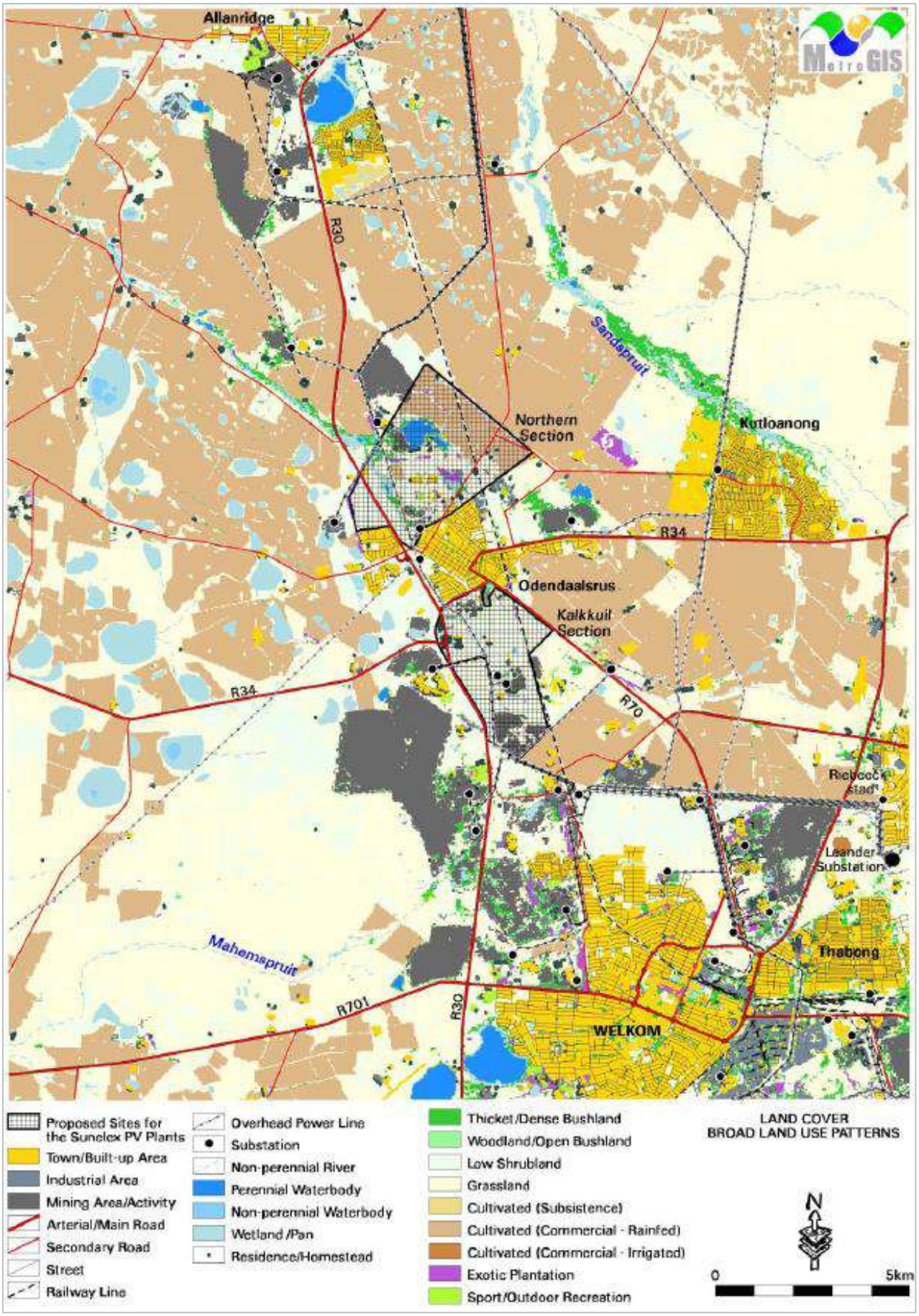


Figure 25: Land cover/land use map (MetroGIS, 2015)

Figure 26: Views of the Phase 1 Site

Figure 27: Views of the Phase 2 Site

The land uses surrounding the sites include the following:

- Phase 1 Site –
  - North – Odendaalsrus town, municipal-owned recreational amenities (including a public park and old caravan park) and dam at Mimosa Park (see **Figure 28** below);
  - West and south – mining (including Harmony's Phakisa Mine);
  - East – mining and industry, as well as recreation (Phakisa Freeway racing circuit); and
  - South-east and north-east – agriculture;
- Phase 2 Site –
  - North, east and west – agriculture;
  - South – Odendaalsrus town;
  - South-west – mining; and

- South-east – industry.

Figure 28: Aerial view of Phase 1 Site, looking south (Odendaalsrus town in foreground)

11.2.2 Radiological Sources

The PV Sites were previously utilised by Harmony Gold Mining Company Ltd for mining activities. A Radiological Survey was undertaken in 2015 of the following four radiological sources (i.e. anything that may cause radiation exposure or releasing radioactive substances or materials) found on the proposed sites (shown in **Figure 29** below):

- Kalkkuil South Tailings (26°41'47.80"E, 27°54'41.37"S);
- Kalkkuil North Tailings (26°41'57.69"E, 27°53'56.40"S);
- Waste Rock Dump (26°40'15.69"E, 27°51'0.51"S); and
- Existing Tailings (26°40'28.15"E, 27°50'11.96"S).

The Radiological Survey concluded the following (SciRAD Consulting, 2015):

- Based on the gamma survey only a small area on the Kalkuil South Tailings and nearly the entire Kalkuil North Tailings need to be removed in order for the total site to be excluded from regulatory control;
- If the above-mentioned tailings material are to be removed, a follow-up survey needs to be conducted to verify that the activity concentrations in the respective areas are indeed below 0.5 Bq/g (exclusion level for radionuclides in soil);
- The National Nuclear Regulator (NNR) may request, if not already performed by Harmony Gold Mining Company Ltd, that a public safety assessment be conducted for the future site use before a land clearance certificate is issued;
- The results of the elemental and full radionuclide analyses will indicate if there are any other radionuclides and pathways that may be of concern; and

- Consequently, the radiological impact of the tailings material (both on- and offsite) on future workers have to be determined to ensure that they are adequately protected when working in the vicinity of tailings storage facilities.

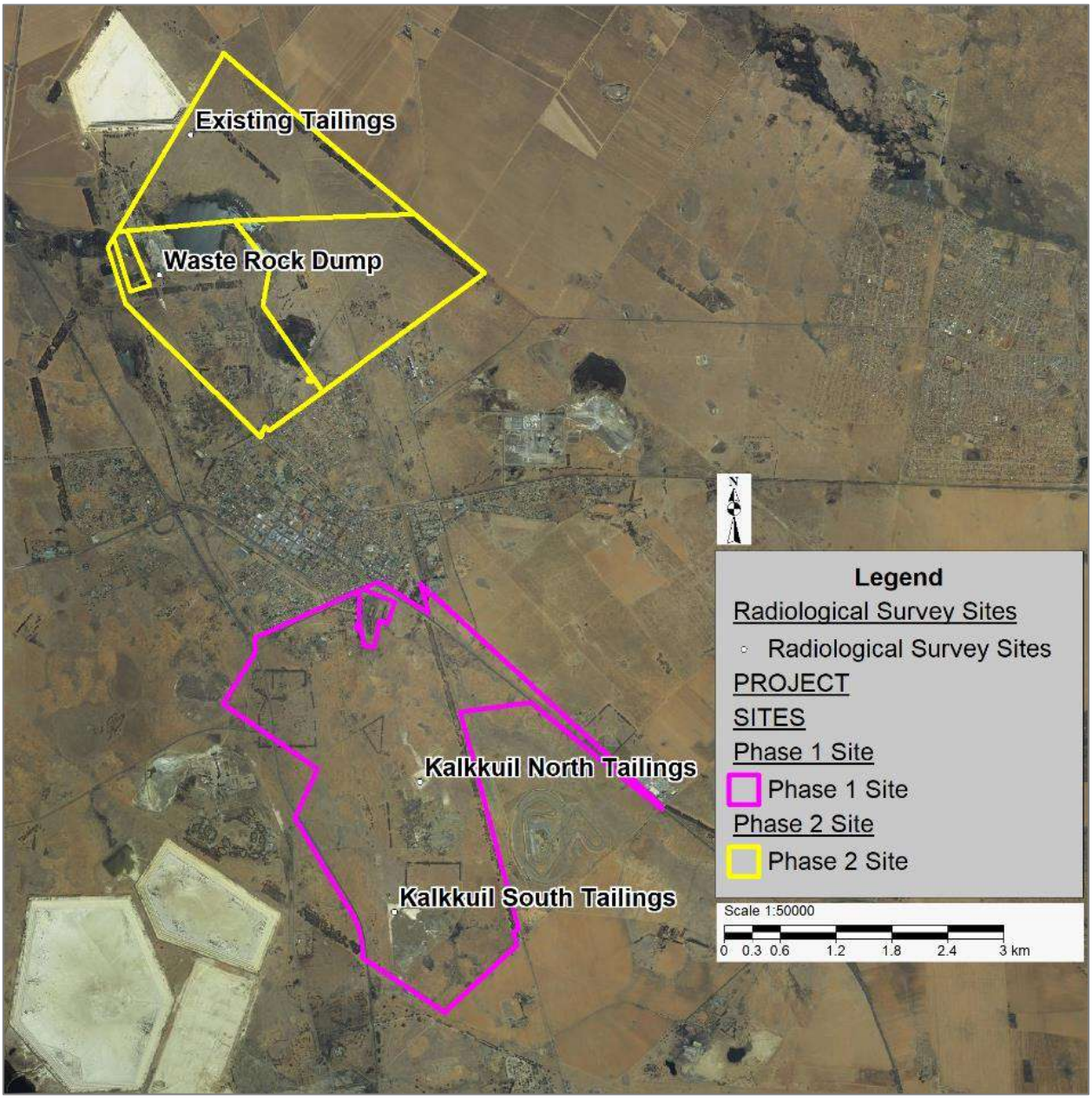


Figure 29: The locations of the three tailings storage facilities and the waste rock dump on the proposed Sunelex sites (SciRAD Consulting, 2015)

A follow up Radiological Survey was undertaken in 2020 and the findings are provided in **Section 12.11** below.

11.2.3 Rehabilitation Requirements

The previous mining company (i.e. Harmony Gold Mining Company Ltd) is responsible for all the surface disturbances on the mining areas which includes, all historical mining and prospecting

activities. There is a Tripartite and Rehabilitation Agreement between Harmony Gold Mining Company Ltd, MLM and the Applicant. Some of the key rehabilitation activities for the mining company to undertake, based on the aforementioned agreement, include the following:

- Dump structures must not be left on the surface, this includes topsoil stockpiles, overburden stockpiles, waste rockpiles, tailing dumps and slime dams;
- All excavations must be backfilled to the natural surface level;
- Removal of the old buildings and foundations on the site;
- Removal of pollutants in the soil and groundwater, if applicable;
- Removal of alien species, such as the Black Wattle occurring on site;
- Removal of slimes dam;
- Removal of vent shaft on site;
- Removal of mine settlements; and
- Removal of old shaft on the north west of the site.

The MLM is responsible for the removal of informal dwellings and illegal dumping areas on the sites, as well as for relocating the people residing in the old mine houses.

11.3 Climate

Rainfall for the site is given as 505 mm per annum with a standard deviation of 115 mm according to the South African Rain Atlas (Water Research Commission, undated). The average monthly distribution of rainfall is shown in **Table 11** below. Local thunderstorms and showers are responsible for most of the precipitation during the summer, from October to March and peaking in January. Hail is sometimes associated with the thunderstorms and mainly occurs in the early summer from October to January with its highest frequency in December.

Table 11: Average monthly rainfall (mm) for the site (27° 47' S 26° 44' E) in mm (Water Research Commission, undated)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Tot
77	70	70	42	18	7	5	8	21	46	65	74	**505**

The proposed development site falls within class 4 (C4) in terms of moisture availability (see **Table 12** below).

Table 12: The classification of moisture availability climate classes for summer rainfall areas across South Africa (Agricultural Research Council, Undated)

Climate class	Moisture availability (Rainfall/0.25 PET)	Description of agricultural limitation
C4	12-18	Moderate to severe

The dominant wind direction is north-easterly. The Weather Bureau has supplied information which indicates that wind speeds of up to 17 m/s can occur (annual frequency of 4 per 100). Generally, however, wind speeds do not exceed 6m/s. The highest wind velocities (on a monthly basis) are generally associated with westerly and north-westerly winds.

The winds are seldom high over the central interior but gust winds of more than 100 km/h associated with thunderstorms can occur. Moderate to fresh winds (30 - 50 km/h) usually occur with the passing of cold fronts. The area is known locally for dust storms with wind velocities capable of lifting the soil off the lands that have been prepared for summer crop cultivation. (5 m/s = 18 km/h = 9.7 knots).

According to Airshed (2015), the annual maximum, minimum and mean temperatures are given as 24°C, 10°C and 17°C, respectively, based on the long-term record. Average daily maximum temperatures range from 29°C in January to 17°C in June, with daily minima ranging from 17°C in January to 2°C in June and July. Sunshine duration in summer is about 60%.

11.4 Geology and Geohydrology

A geotechnical investigation was undertaken for the Project to provide an overview of the expected geological and geotechnical conditions encountered at the sites. An extract from the Geotechnical Report (Jeffares & Green, 2016) follows.

- Phase 1 Site –
  - The geology map shown in **Figure 30** below indicates that the Phase 1 Site is underlain predominantly by windblown sands. The windblown sands, colloquially known as “Kalahari Sands”, consist of rounded quartz grains coloured by a thin coating of haematite, which results in the characteristic red to red-brown colour of the soils. These soils frequently exhibit an open-voided grain structure and can be prone to collapse settlement.
  - These sands are generally underlain by calcretes or contain various amounts of ferricretes. Calcrete / ferricrete are a pedogenic material formed by the precipitation of calcium carbonate / iron oxides. The material occurs in varying forms, characterised by the degree of cementation. Often a layer of hard calcrete is underlain by softer, residual material.
  - The calcretes overlie residual soils and mudstones of the Volksrust Formation, of the Ecca Group, Karoo Supergroup.
  - Residual soils develop from the weathering of the mudstones (fine grained siliciclastic sedimentary rocks - siltstone, claystone, mudstone, slate, and shale) of the Karoo Supergroup and may contain active clay minerals of the smectite group. The climatic Nvalue for the site is approximately 5, and it is anticipated that the clayey residual soils at Phase 1 are moderately expansive.

- Alluvial deposits, formed by sedimentation along a river or stream, are shown to occur in a narrow band in the eastern section of the site, following south-easterly to north-westerly trending drainage line.
- No groundwater seepage was encountered in any of the test pits excavated on Phase 1 site. However, the investigation was undertaken during a period of drought and some groundwater seepage should be expected after rainfall events, particularly during the wetter summer season. Care must be taken in the vicinity of surface water bodies and slimes dams as the subsoils will be prone to collapse when wet.
- Seasonally shallow groundwater conditions are expected within and adjacent to the pans and wetland areas observed on the site. Surface water ponding is also expected within the pans and wetlands.
- Various developments and associated infrastructure were found to be present at the Phase 1 Site, as shown in **Figure 31** below. *Refer to other existing structures and infrastructure noted in **Section 11.11** below.*

MAP SYMBOL	STRATIGRAPHY	LITHOLOGY
Qs	Quaternary Age	Aeolian sands
Jd	Jurassic Age Intrusion	Dolerite
Pa	Adelaide Subgroup, Beaufort Group, Karoo Supergroup	Sandstone, mudstone, siltstone
Pvo	Volksrust Formation, Ecca Group, Karoo Supergroup	Mudstone, siltstone, shale

Figure 30: Phase 1 Site Geology (extracted from 1:250 000 scale Geological Map 2726 Kroonstad, Council for Geoscience) with Stratigraphy and Rock Types shown in table (Jeffares & Green, 2016)

1 Landfill site (unfenced)
2 Partly demolished mine infrastructure (slabs, foundations remain)
3 Stockpiles (predominantly quartzite) & old mine workings
4 Stream and potential wetland area
5 Potential wetland area
6 Slimes dams and erosion plume
7 A railway line running along the treeline (illustrated in blue). A large-diameter water pipeline runs to the west of the railway line.
8 Substation and ventilation shaft
9 Quartzite stockpile
10 Slimes dam

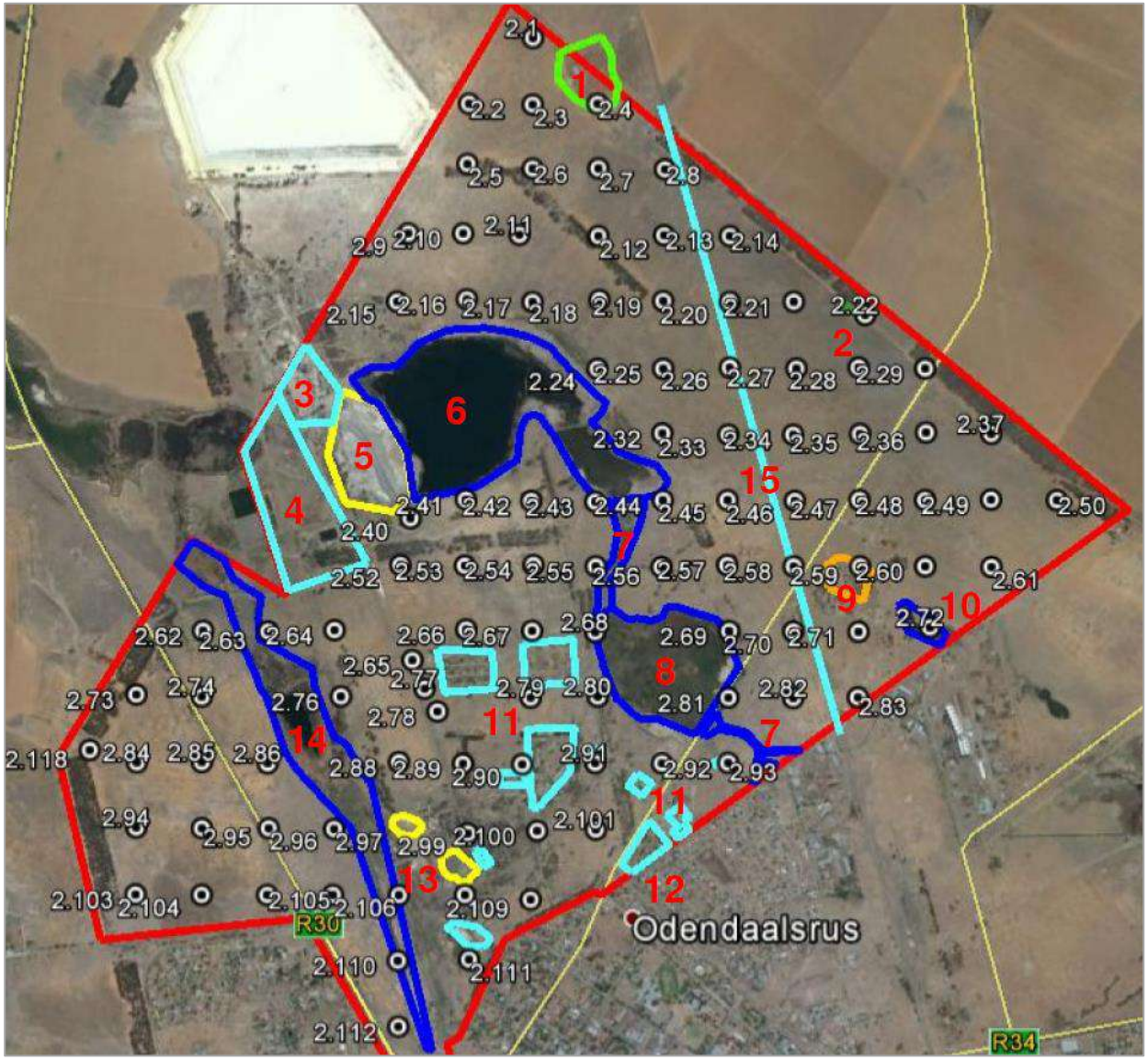
Figure 31: Features Map Phase 1 Site (Jeffares & Green, 2016)

❖ Phase 2 Site –

- The geology map shown in **Figure 32** below indicates that the Phase 2 Site is almost entirely underlain by windblown sands.
- These sands have varying thicknesses and are interpreted to be underlain predominantly by mudstones of the Volksrust Formation, of the Ecca Group, Karoo Supergroup.
- Calcrete / ferricretes are present in the area, underlying the aeolian sands.
- As observed over the Phase 1 Site, the aeolian soils on the Phase 2 site exhibit an openvoided, pinholed grain structure which is indicative of potentially collapsible soils.
- No groundwater seepage was encountered in any of the test pits excavated on Phase 2 site. However, the investigation was undertaken during a period of drought and some groundwater seepage should be expected after rainfall events, particularly during the wetter summer season. Test pits were not excavated in valley bottoms, and groundwater seepage is expected in these areas. Care must be taken in the vicinity of surface water bodies and wetlands as the subsoils will be prone to collapse when wet.
- Various developments and associated infrastructure were found to be present at the Phase 5 Site, as shown in **Figure 33** below. *Refer to other existing structures and infrastructure noted in **Section 11.11** below.*

MAP SYMBOL	STRATIGRAPHY	LITHOLOGY
Qs	Quaternary Age	Aeolian sands
Jd	Jurassic Age Intrusion	Dolerite
Rb	Bothaville Formation, Ventersdorp Supergroup	Quartzite, conglomerate, greywacke

Figure 32: Phase 2 Site Geology (extracted from 1:250 000 scale Geological Map 2726 Kroonstad, Council for Geoscience) with Stratigraphy and Rock Types shown in table (Jeffares & Green, 2016)



1	Existing borrow pit
2	Graves around 2.22
3	Old mine infrastructure
4	Sewage treatment plant
5	Mine stockpile
6	Large dam
7	Stream and associated wetlands
8	Wetland
9	Informal landfill
10	Possible spring and associated wetland
11	Old mine infrastructure
12	Residential area
13	Mine stockpiles
14	Drainage line, dam and associated wetland
15	Railway line

Figure 33: Features Map Phase 2 Site (Jeffares & Green, 2016)

11.5 Soils

The information to follow was obtained from the Agricultural Impact Assessment (see **Appendix H4**). Refer to **Sections 12.6** and **13.15** for a synopsis of the study and a related impact assessment, respectively.

In general three major groups of soils occur in the Project area (as shown in **Figure 34** below):

1. Deep Aeolian sands on underlying sand and mudstone. The dominant soil types are Clovelly and Hutton, with areas where the subsurface layers of clayey layers are exposed that are Valsrivier. These soils are highly prone to wind erosion if the vegetation cover is removed. At the Phase I Site, soils are variable in depth with deeper Clovelly soils mostly on isolated narrow strips. The only substantial area with deeper soils located in the south eastern part of the site. At the Phase 2 Site especially in the eastern section consists of deep yellow and reddish soils that are arable.
2. Shallow soils that occur mainly on the mudstone base rock of the Ecca Formations. These occur mainly at the Phase 1 land. They are shallow and generally referred to as duplex soils. They are not arable for cultivation and should be uses as grazing.
3. The third group consists of areas that are under infrastructure, land with rubble or disturbed soils that are not suitable for cultivation unless restored. Large portions of the Phase 1 Site and the western side of the Phase 2 Site fall into this category.

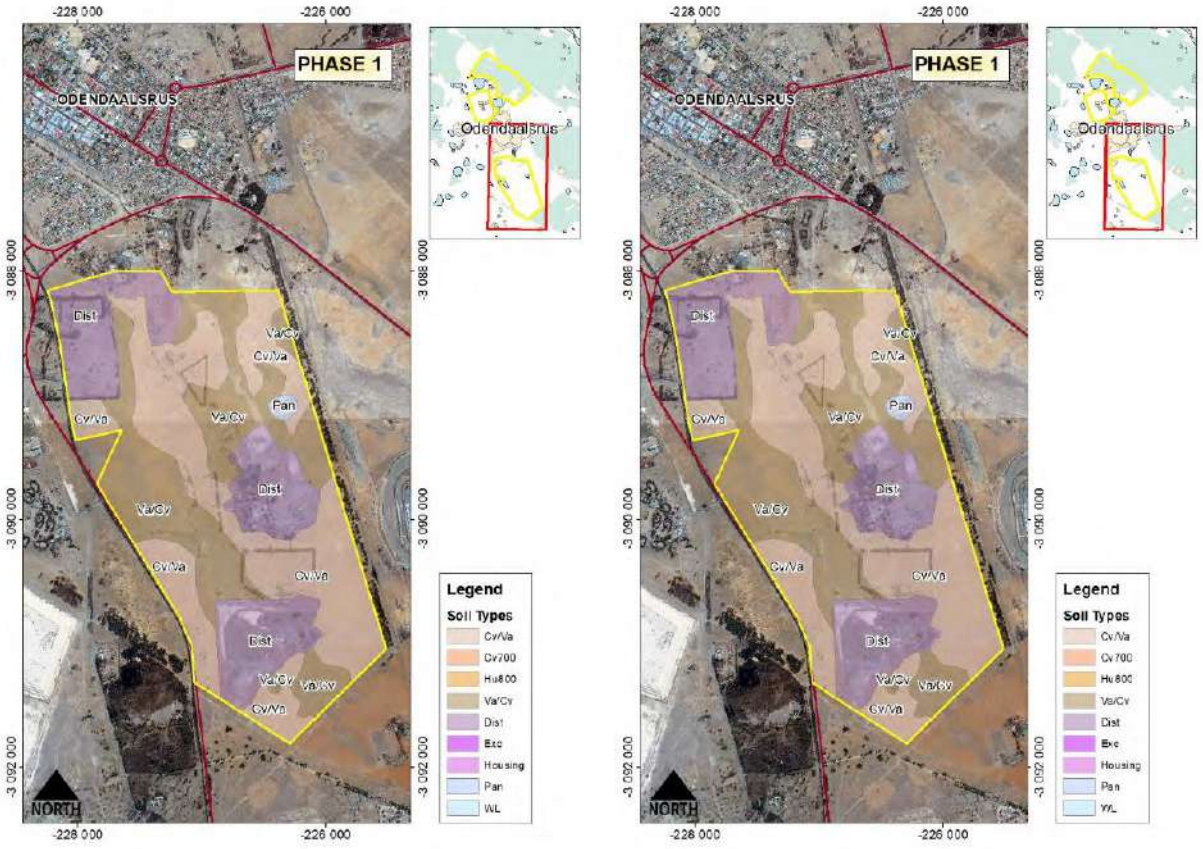


Figure 34: Soil types at the PV sites (Index, 2020)

11.6 Topography

The entire study area is located on the Highveld and the terrain morphology is described as Plains and Pans of the Central Interior Plain. The study area has an even flat slope ranging from 1440m above sea level (near Riebeeckstad) to 1290m to the north-west and south-west. The most prominent topographical features are the man-made mine dumps often dominating the skyline (MetroGIS, 2015). Slopes across the study area are less than 1% (refer to **Figure 35** below).

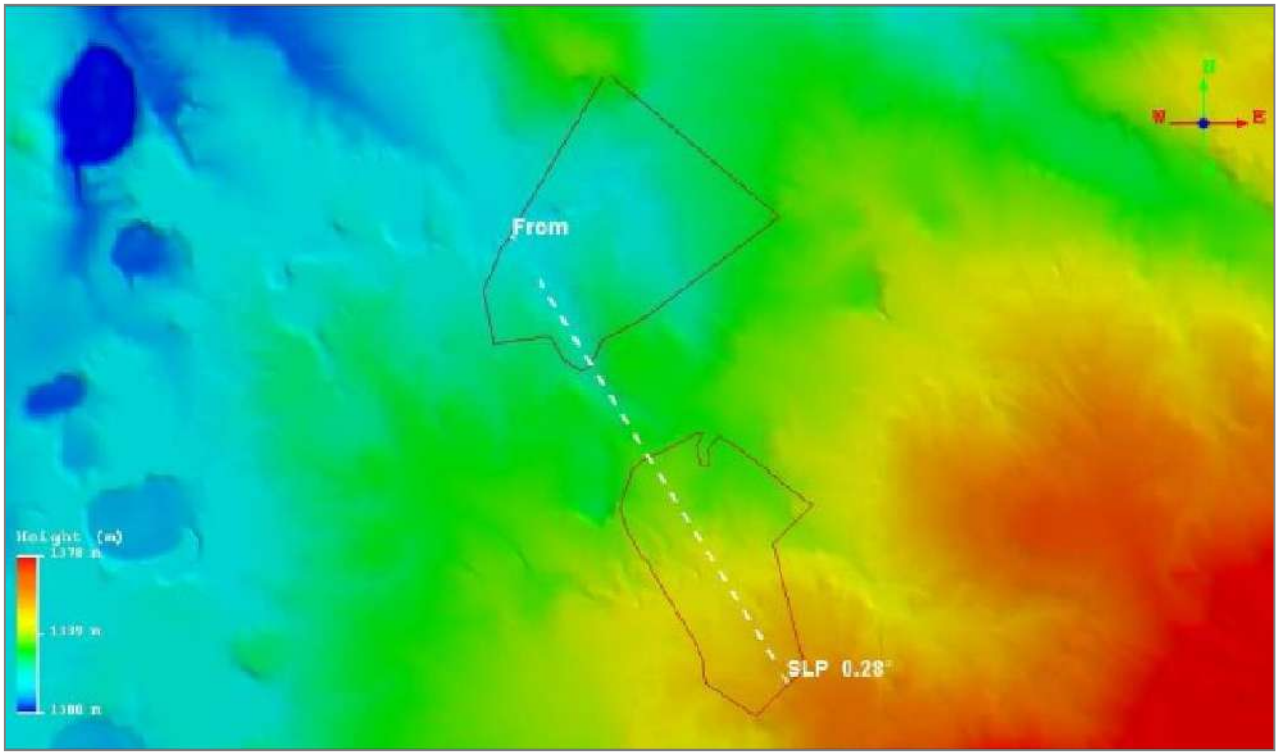


Figure 35: Digital Elevation Model (adapted from MetroGIS, 2015) indicating the bigger landscape setting and the average slope of the study area (white dotted line) is 0.49%/0.28°

No perennial rivers are present on the sites. The Mahemspruit (south-west of Phase 1 Site), Sandspruit (north-east of Phase 2 Site) and a non-perennial river (west of Phase 2 Site) are the most prominent rivers in the greater area (MetroGIS, 2015).

11.7 Surface Water

The information to follow was obtained from the Water Resources Impact Assessment (see **Appendix H1**). Refer to **Sections 12.3** and **13.12** for a synopsis of the study and a related impact assessment, respectively.

11.7.1 Catchments

The watercourses associated with the Phase 1 Site are located in the C43B quaternary catchment, within the Vaal Water Management Area (WMA). The Phase 2 Site does not overlap with any rivers. The relevant Sub-Quaternary Reach (SQR) is the C43B-2578 for Phase 1.

11.7.2 National Freshwater Ecosystem Priority Area Status

The National Freshwater Ecosystem Priority Areas (NFEPA) database forms part of a comprehensive approach for the sustainable and equitable development of South Africa's scarce water resources. This database provides guidance on how many rivers, wetlands and estuaries, and which ones, should remain in a natural or near-natural condition to support the water resource protection goals of the NWA.

According to Nel *et al.* (2011), in the Phase 1 Site one FEPA wetland can be found in the 500 m regulated area, while in the Phase 2 Site no FEPA wetlands can be found (refer to **Figure 36** and **Figure 37** below).

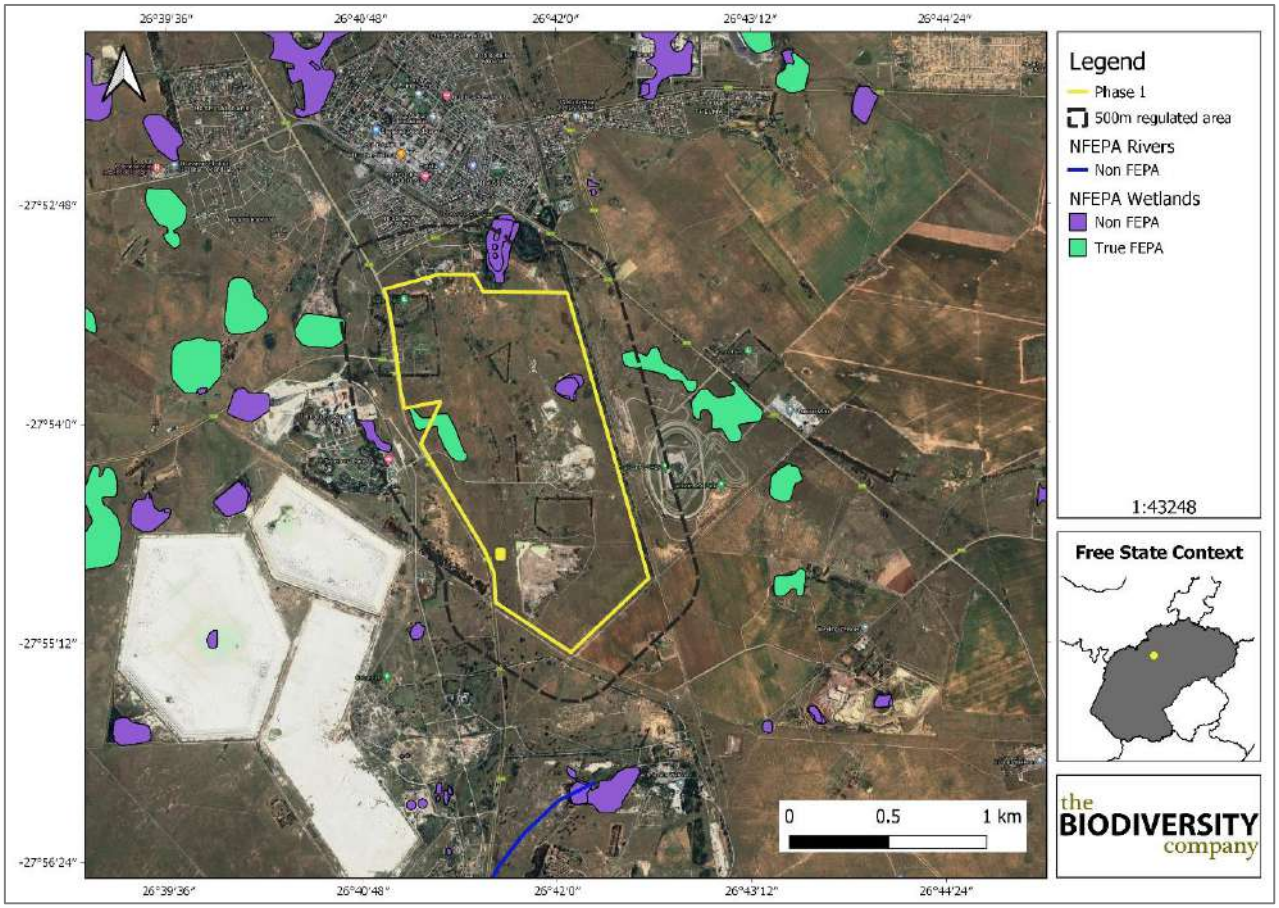


Figure 36: Phase 1 Site in relation to NFEPAs (TBC, 2020a)

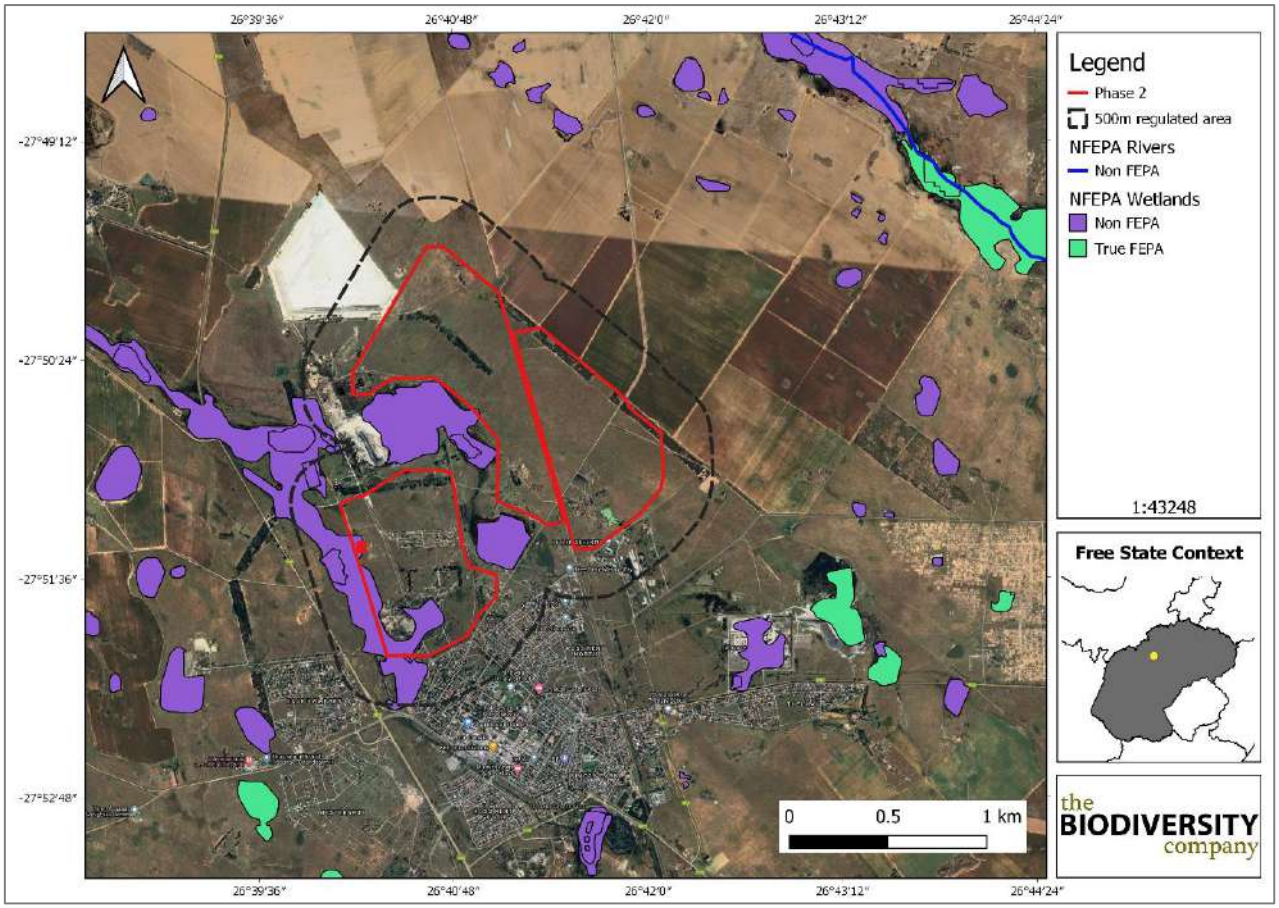


Figure 37: Phase 2 Site in relation to NFEPAs (TBC, 2020a)

11.7.3 Sub Quaternary Reaches

The desktop Present Ecological Status (PES) of the Sand River tributary SQR associated with the Phase 1 Site was undefined, however the nearest classed SQR with similar land use was used for desktop data. This SQR was a class E or seriously modified in 2014, this has further been affected and in 2018 was classified as a class F. The seriously modified state of each reach is attributed to large to serious impacts to instream habitat, wetland and riparian zone continuity, flow modifications and serious potential impacts on physico-chemical conditions (water quality). The factors influencing the current PES status for the catchment include urban area and associated land use activities, industrial and mining activities, irrigation, road network, slimes dams, wastewater treatment works and return flows, alien vegetation, instream weirs and dams.

The two Sandspruit SQRs associated with the Phase 2 Site were classified as class C in 2014 and in 2018 when the classification was reassessed it was still a class C. The ecological importance and sensitivity of the river reaches were all rated as moderate. The moderately modified state of each reach is attributed to small to large impacts to instream habitat, wetland and riparian zone continuity, flow modifications and large potential impacts on physico-chemical conditions (water quality). The factors influencing the current PES status for the catchment includes road network, degraded lands, human settlements, wastewater treatment works and return flows, and agricultural activities.

11.7.4 Spatially Sensitive Mapping

According to the National Web-based Environmental Screening Tool, the combined aquatic biodiversity theme for the Phase 1 and Phase 2 Sites is classified as having mostly a low sensitivity rating with only small portions classified as very high sensitivity (see **Figure 38** below). It is worth noting these very high sensitivity resources are not within the proposed Project areas, but rather within the 500m regulated areas.

Figure 38: Aquatic Theme Biodiversity Combined Sensitivity of Phase 1 (top) and Phase 2 (bottom) (National Web based Environmental Screening Tool) (TBC, 2020a)

Given the extent of wetlands within the project footprint, it is recommended that the wetland sensitivities be considered jointly with the aquatic sensitivities as these systems are interconnected in a hydrological sense.

11.7.5 National Biodiversity Assessment Wetlands and Rivers

This spatial dataset is part of the South African Inventory of Inland Aquatic Ecosystems (SAIIAE) which was released as part of the National Biodiversity Assessment (NBA), 2018. National Wetland Map 5 includes inland wetlands and estuaries, associated with river line data and many other data sets within the SAIIAE 2018.

Figure 39 and **Figure 40** below show the ecosystem threat status for the sites as follows:

- Phase 1 - LC and CR wetlands; and
- Phase 2 – LC and CR wetlands in the 500m regulated area.

Figure 41 and **Figure 42** below show the protection level for the sites as follows:

- Phase 1 - Poorly protected and not protected wetlands; and
- Phase 2 – Not protected and poorly protected wetlands.

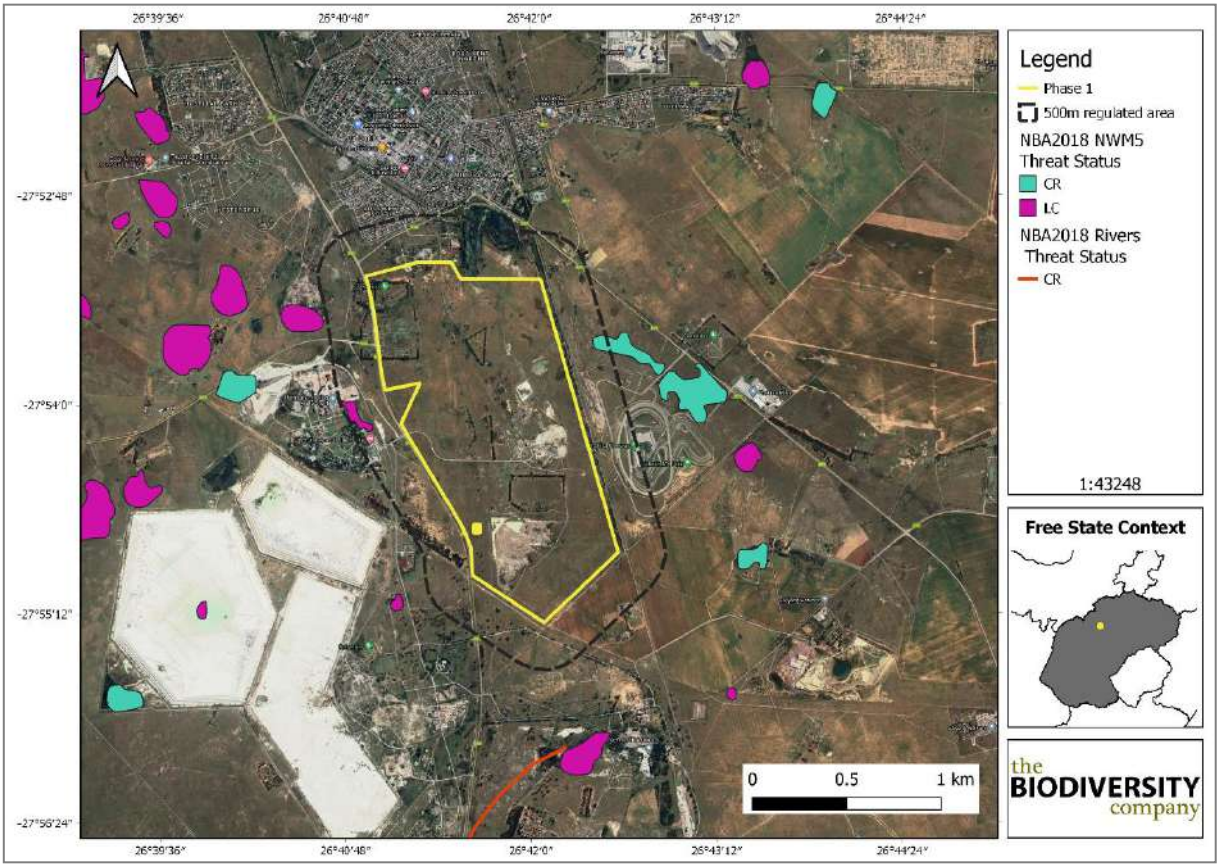


Figure 39: Phase 1 Site in relation to the wetlands and rivers threat status (NBA, 2018) (TBC, 2020a)

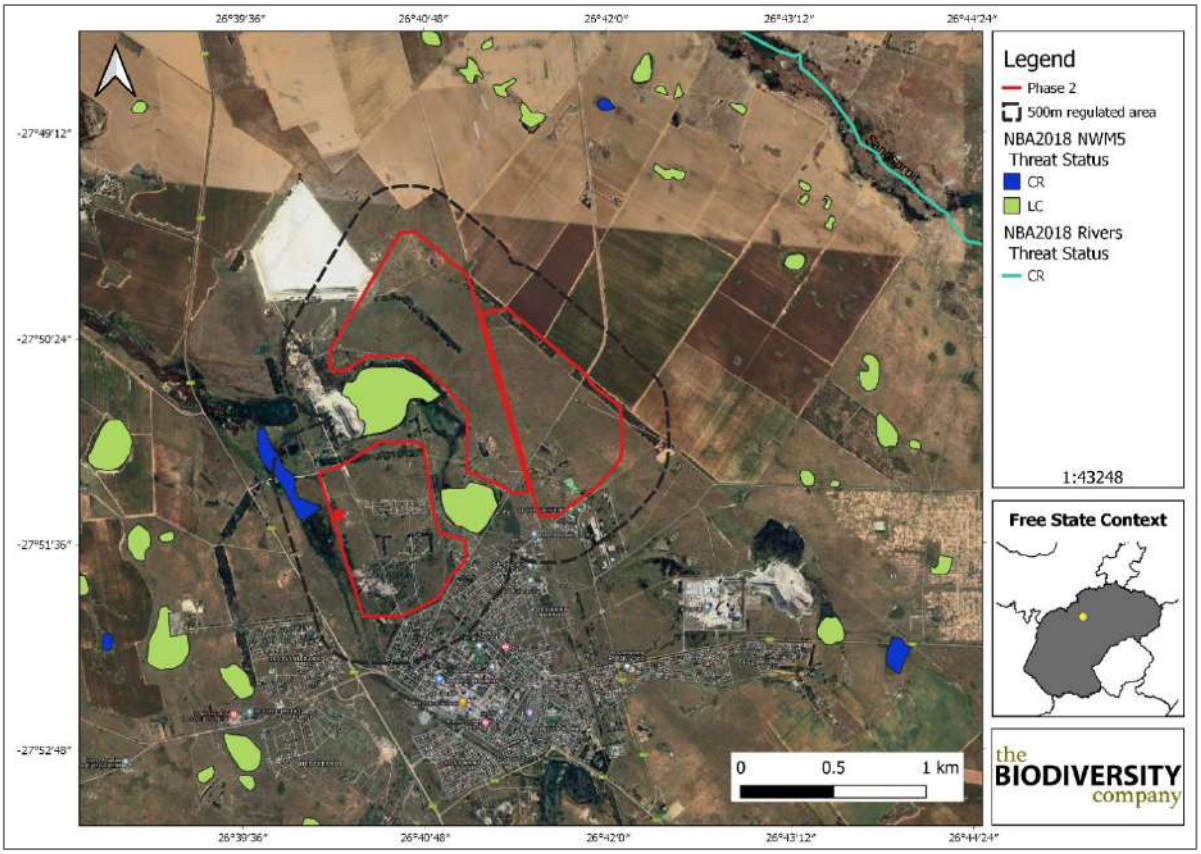


Figure 40: Phase 2 Site in relation to wetlands & rivers threat status (NBA, 2018) (TBC, 2020a)

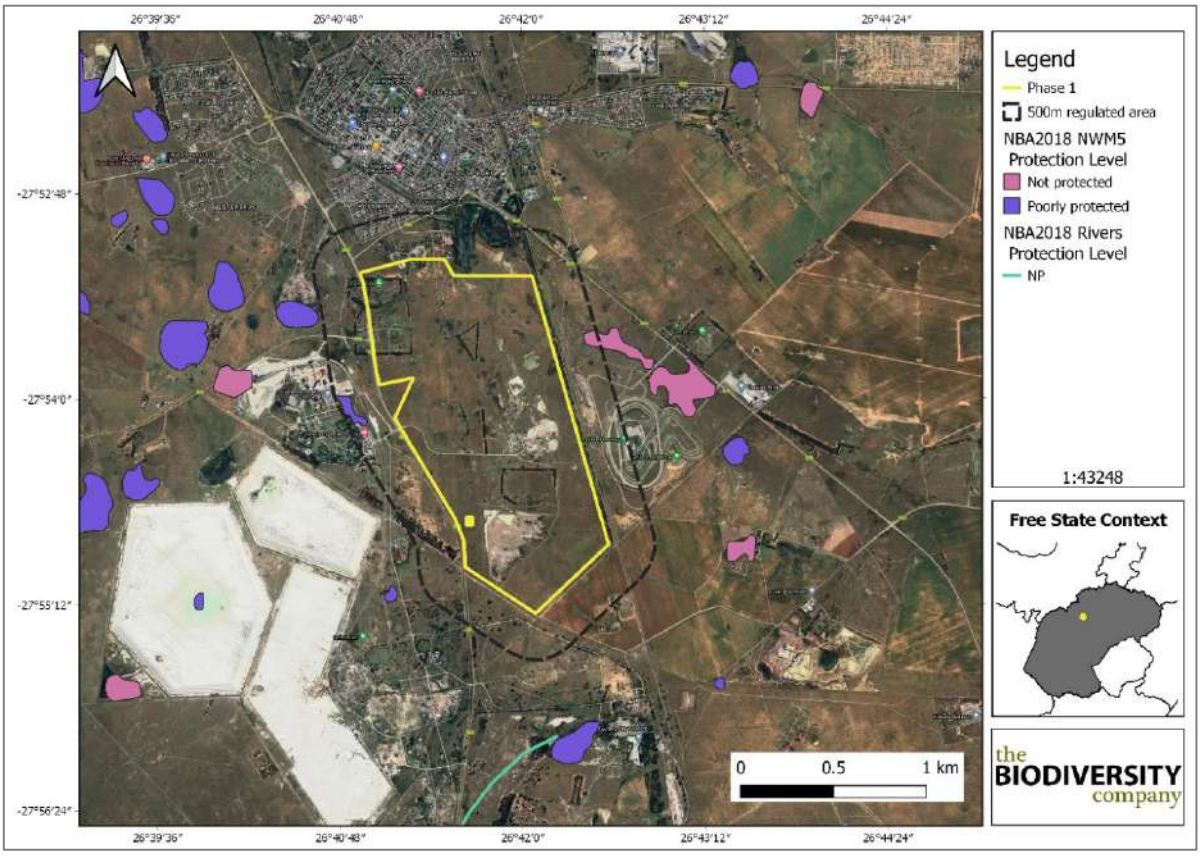


Figure 41: Phase 1 Site in relation to wetlands & rivers protection level (NBA, 2018) (TBC, 2020a)

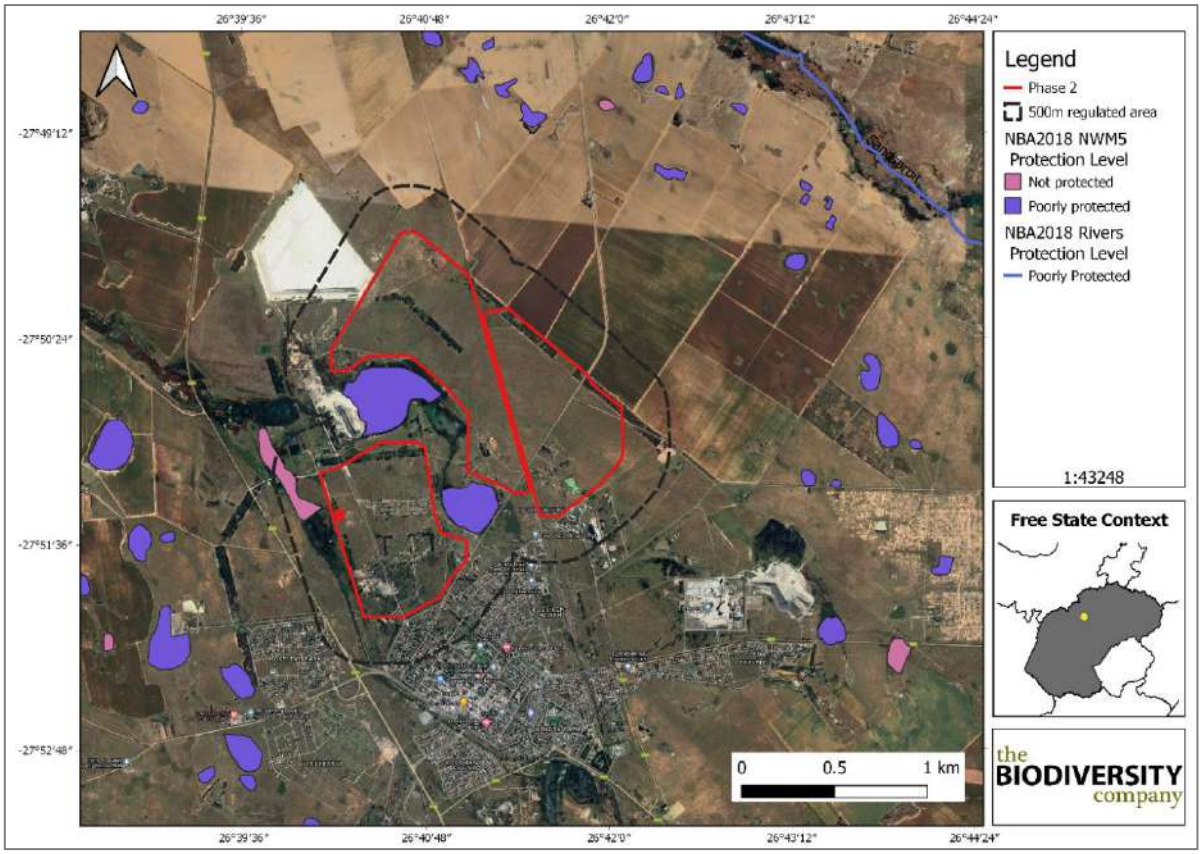


Figure 42: Phase 2 Site in relation to wetlands & rivers protection level (NBA, 2018) (TBC, 2020a)

11.7.6 Inland Water

The topographical data for the inland waters for the quarter degree square "2726" was applied to the 500m regulated area.

Phase 1 Site's 500 m regulated area overlaps with a non-perennial pan, a marsh vlei, dam and a drainage line (see **Figure 43** below). Phase 2 Site's 500 m regulated area overlaps with a dam, a non-perennial dam, a marsh vlei, and both drainage lines and river lines (see **Figure 44** below).

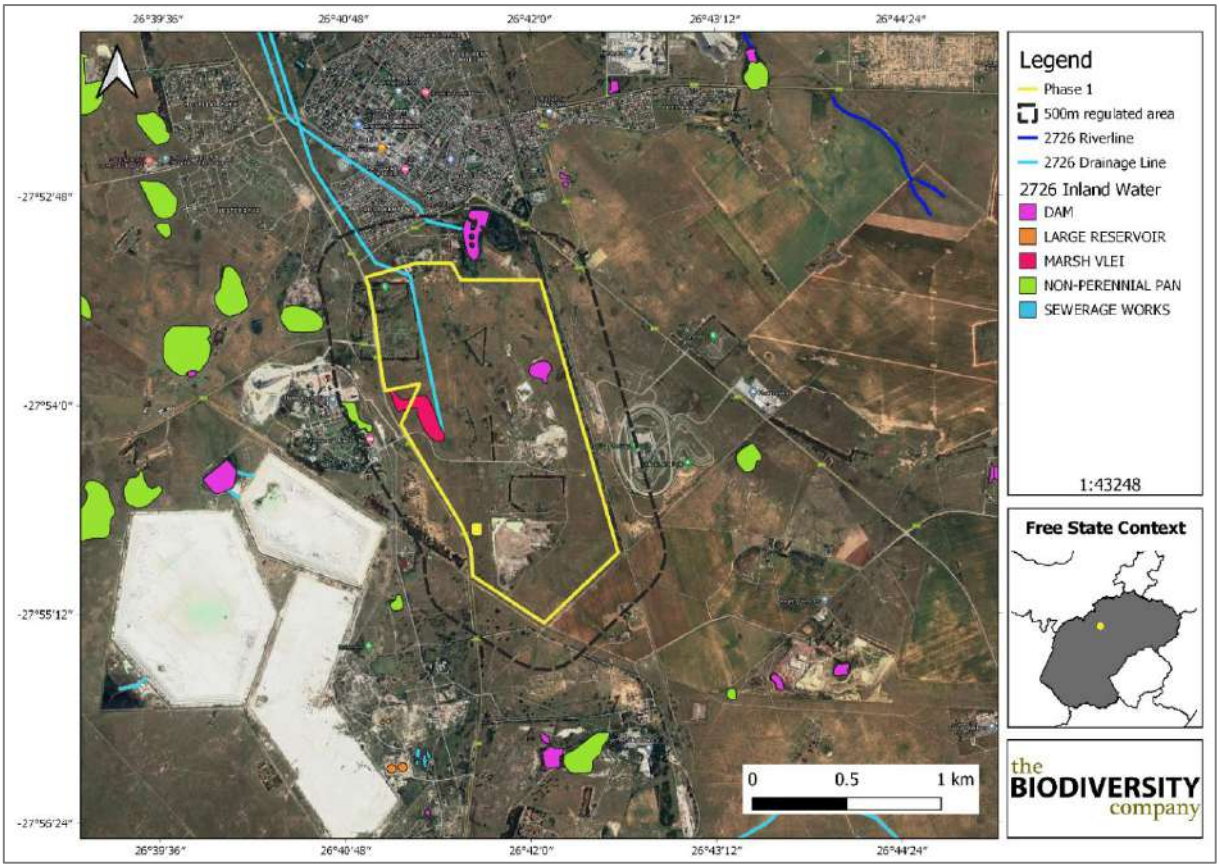


Figure 43: Phase 1 Site in relation to inland water data (TBC, 2020a)

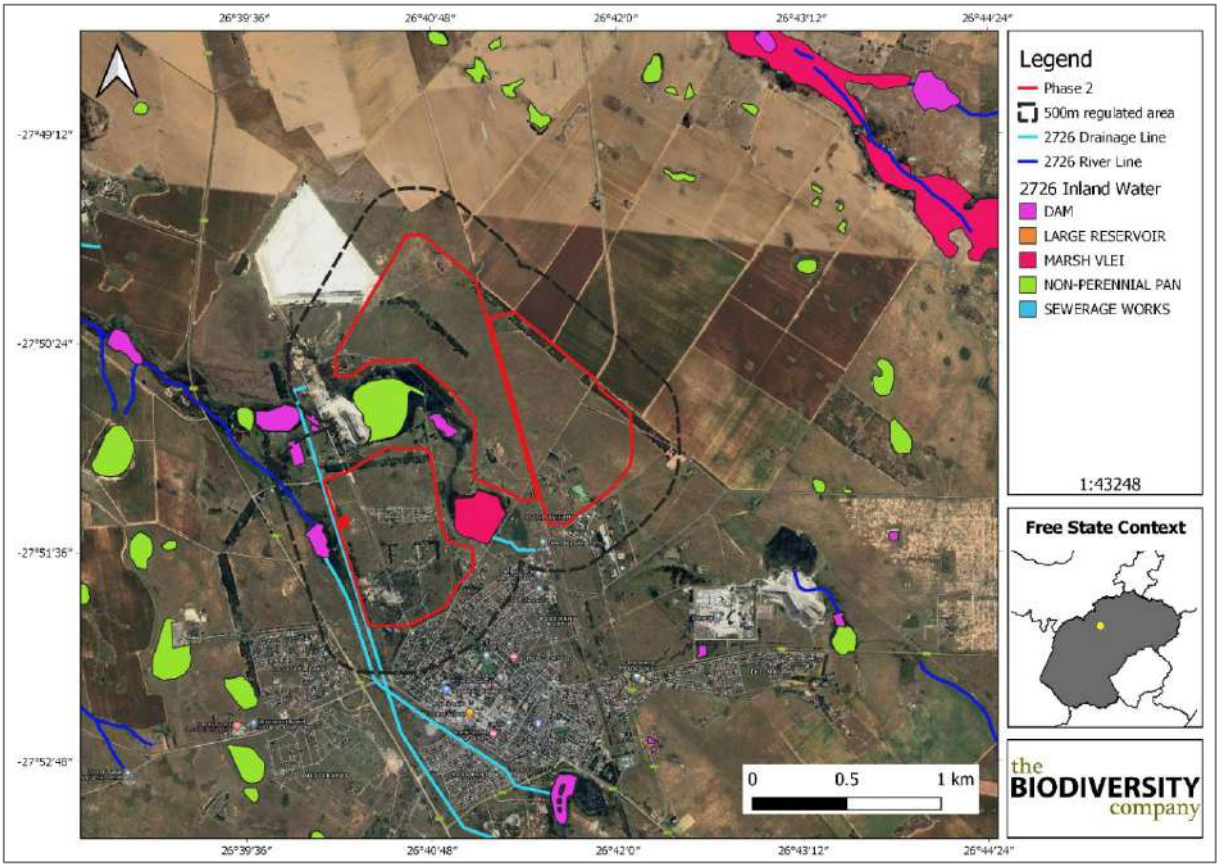


Figure 44: Phase 2 Site in relation to inland water data (TBC, 2020a)

11.8 Flora & Fauna

The information to follow was sourced from the Terrestrial Ecology Assessment (see **Appendix H2**). Refer to **Sections 12.4** and **13.13** for a synopsis of the study and a related impact assessment, respectively.

11.8.1 Free State Biodiversity Conservation Plan

A Critical Biodiversity Areas (CBA) is considered a significant and ecologically sensitive area and needs to be kept in a pristine or near-natural state to ensure the continued functioning of ecosystems (SANBI, 2017). A CBA represents the best choice for achieving biodiversity targets. Ecological Support Areas (ESAs) are not essential for achieving targets, but they play a vital role in the continued functioning of ecosystems and often are essential for proper functioning of adjacent CBAs.

According to the Free State Biodiversity Conservation Plan (shown in **Figure 45** below), the proposed project area encroaches into the following areas:

- Phase 1 Site –
  - ESA 1;
  - ESA2;
  - CBA1;
  - Degraded and
  - Other.
- Phase 2 Site –
  - CBA1;
  - ESA1;
  - ESA2;
  - Other; and
  - Degraded.

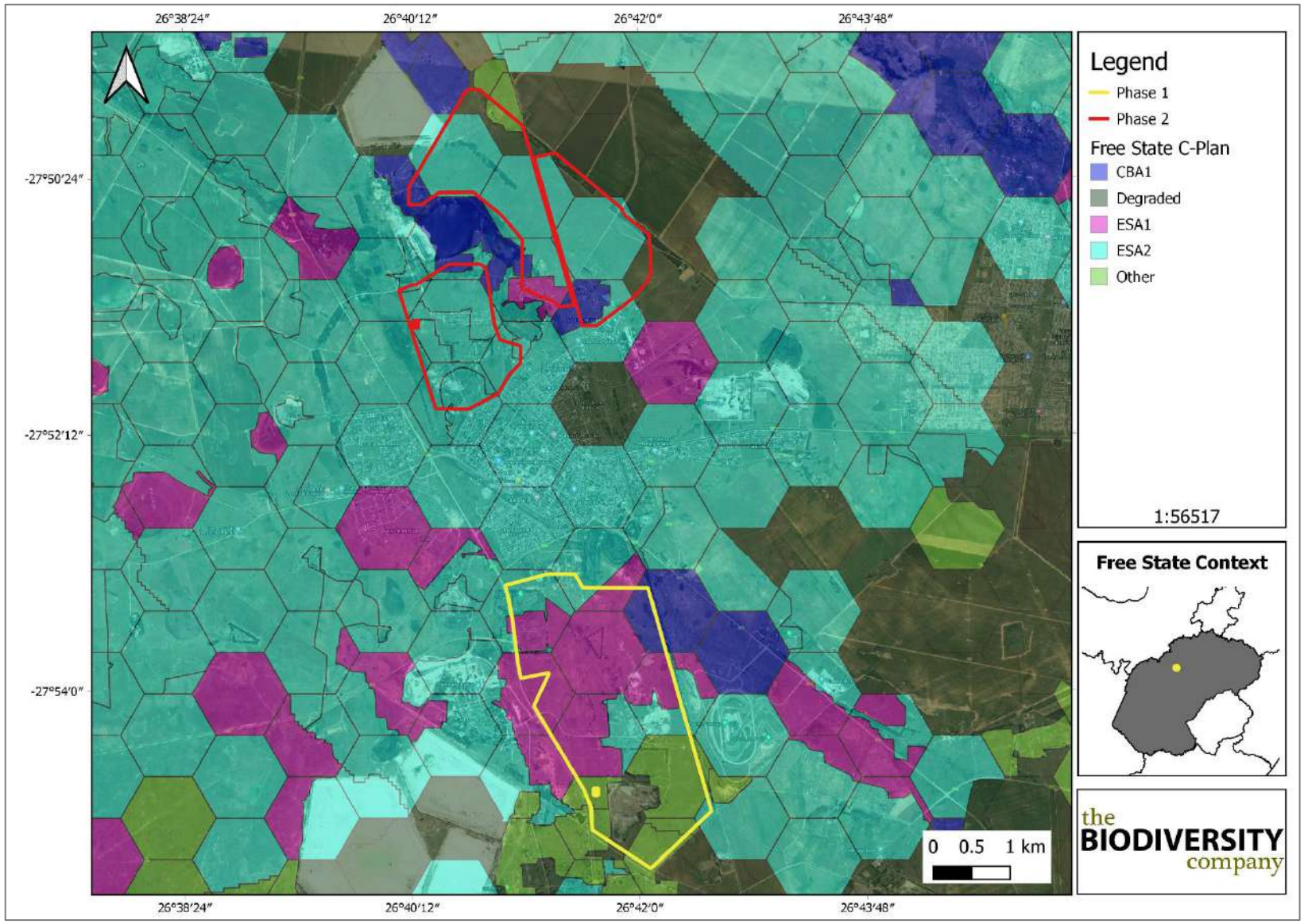


Figure 45: **The project area superimposed on the Free States' Biodiversity Conservation Plan (FSBCP), 2015 (TBC, 2020b)**

11.8.2 The National Biodiversity Assessment

The purpose of the National Biodiversity Assessment (NBA) is to assess the state of South Africa's biodiversity with a view to understanding trends over time and informing policy and decision-making across a range of sectors (Skowno *et al*., 2019). The two headline indicators assessed in the NBA are *ecosystem threat status* and *ecosystem protection level* (Skowno *et al*., 2019).

11.8.2.1 Ecosystem Threat Status

Ecosystem threat status outlines the degree to which ecosystems are still intact or alternatively losing vital aspects of their structure, function and composition, on which their ability to provide ecosystem services ultimately depends (Skowno *et al*., 2019). Ecosystem types are categorised as Critically Endangered (CR), Endangered (EN), Vulnerable (VU) or Least Concerned (LC), based on the proportion of each ecosystem type that remains in good ecological condition (Skowno *et al*., 2019).

The project area was superimposed on the terrestrial ecosystem threat status (shown in **Figure 46** below). The Phase 1 Site is situated within an ecosystem that is listed as LC, while the Phase 2 Site includes areas listed as EN and LC.

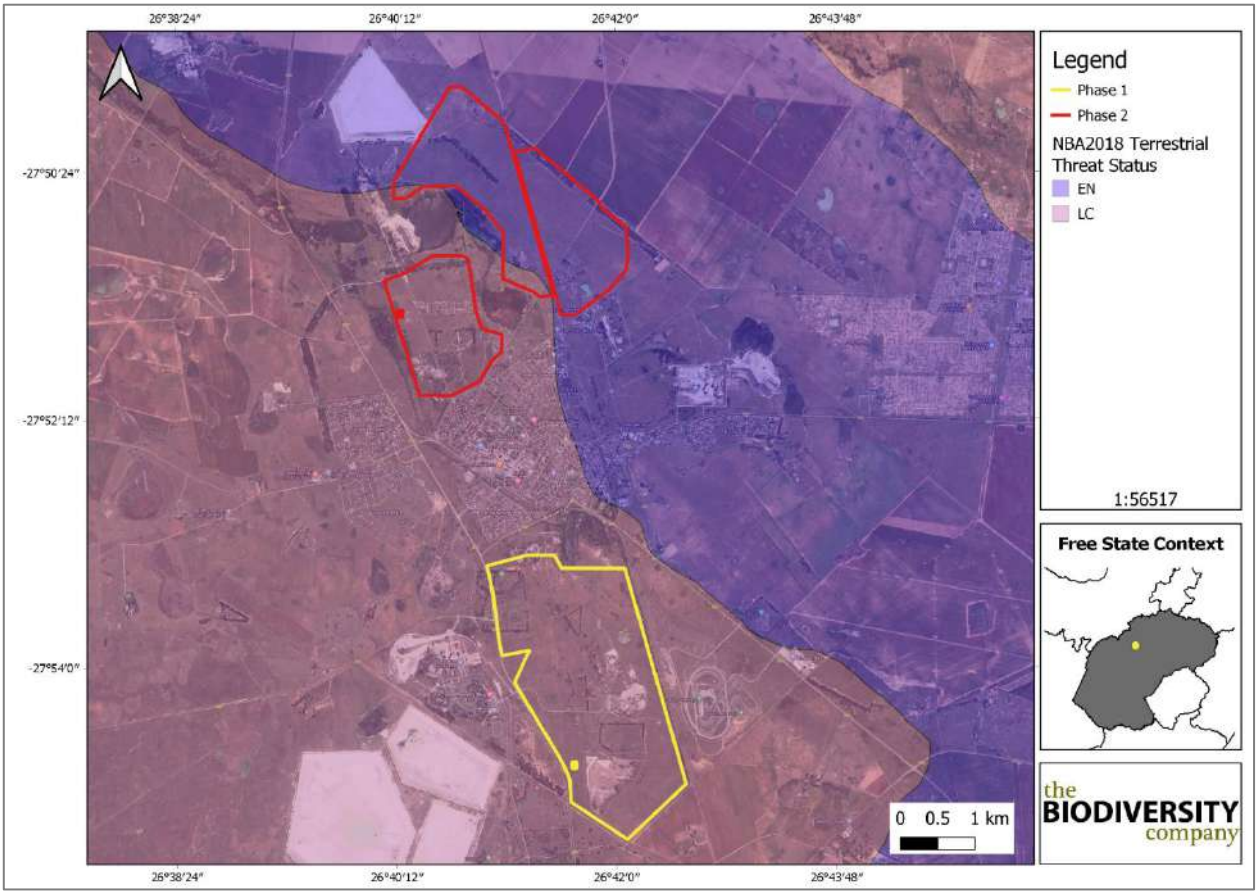


Figure 46: Regional ecosystem threat status of the associated terrestrial ecosystems (NBA, 2018) (TBC, 2020b)

11.8.2.1 Ecosystem Protection Level

Ecosystem protection level tells us whether ecosystems are adequately protected or under-protected. Ecosystem types are categorised as not protected, poorly protected, moderately protected or well protected, based on the proportion of each ecosystem type that occurs within a protected area recognised in the Protected Areas Act (Skowno *et al*., 2019).

The project area was superimposed on the ecosystem protection level map to assess the protection status of terrestrial ecosystems associated with the development (see **Figure 47** below). The terrestrial ecosystems associated with the Phase 1 Site are rated as *Poorly Protected* and the protection level associated with the Phase 2 Site is rated as *Not Protected and Poorly Protected*. This means that these ecosystems are considered not to be adequately protected in areas such as national parks or other formally protected areas.

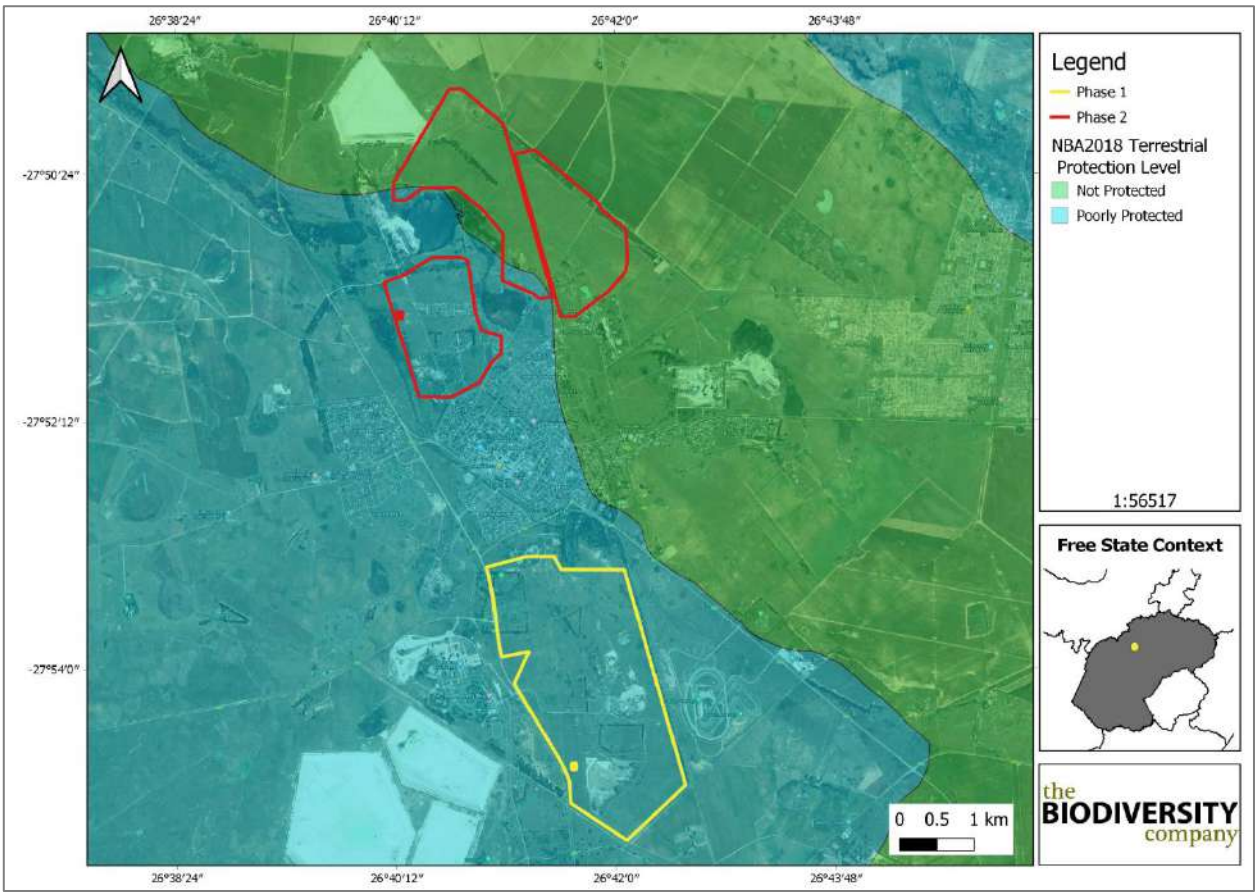


Figure 47: Regional level of protection of terrestrial ecosystems (NBA, 2018) (TBC, 2020b)

11.8.3 Flora

11.8.3.1 Biomes

The Phase 1 Site is situated within the grassland biome, while the Phase 2 Site falls in the grassland and azonal vegetation. The grassland biome is centrally located in southern

Africa, and adjoins all except the desert, fynbos and succulent Karoo biomes (Mucina & Rutherford, 2006).

Grasslands are dominated by a single layer of grasses. The amount of cover depends on rainfall and the degree of grazing. The grassland biome experiences summer rainfall and dry winters with frost (and fire), which are unfavourable for tree growth. Thus, trees are typically absent, except in a few localized habitats. Geophytes (bulbs) are often abundant. Frosts, fire and grazing maintain the grass dominance and prevent the establishment of trees.

The Azonal vegetation is formed in and around flowing and stagnant freshwater bodies. Habitats with high levels of salt concentration form a highly stressed environment for most plants and often markedly affect the composition of plant communities. Invariably, both waterlogged and salt-laden habitats appear as 'special', deviating strongly from the typical surrounding zonal vegetation. They are considered to be of azonal character.

11.8.3.2 Vegetation Types

The grassland biome comprises many different vegetation types. The Phase 1 Site is situated in the Western Free State Clay Grassland, while the Phase 2 Site is situated within the Western Free State Clay Grassland and Vaalvet Sandy Grassland vegetation types according to SANBI (2018) (see **Figure 48** below).

11.8.3.3 Plant Species of Conservation Concern

Based on the Plants of Southern Africa (BODATSA-POSA, 2019) database, 515 plant species have the potential to occur in the Project area and its surroundings. Of these, one (1) species is listed as being Species of Conservation Concern (SCC), namely *Brachystelma dimorphum* subsp. *gratum*. This is a highly endemic species with one known area of occurrence, which is the salt clay pans surrounding Welkom. This CR species is threatened by habitat degradation due to urban and industrial expansion, mining, agriculture, alien invasive plants and pollution.

Figure 48: Vegetation types in the Project Area (BGIS, 2018) (TBC, 2020b)

11.8.4 Fauna

11.8.4.1 Avifauna

The information contained in this sub-section was sourced from the Avifaunal Assessment (see **Appendix H3**). Refer to **Sections 12.5** and **13.10** for a synopsis of the study and a related impact assessment, respectively.

Important Bird and Biodiversity Area

Important Bird & Biodiversity Areas (IBAs) are the sites of international significance for the conservation of the world's birds and other conservation significant species as identified by BirdLife International. These sites are also all Key Biodiversity Areas; sites that contribute significantly to the global persistence of biodiversity (Birdlife, 2017).

The Project areas is approximately 60 km from both the Sandveld and Bloemhof Dam Nature Reserve IBA and the Willem Pretorius Game Reserve IBA.

Coordinated Avifaunal Roadcount (CAR)

The ADU/Cape bird club pioneered avifaunal roadcount of larger birds in 1993 in South Africa. Originally it was started to monitor the Blue Crane *Anthropoides paradiseus* and

Denham's/Stanley's Bustard *Neotis denhami*. Today it has been expanded to the monitoring of 36 species of large terrestrial birds (cranes, bustards, korhaans, storks, Secretarybird and Southern Bald Ibis) along 350 fixed routes covering over 19 000 km.

Twice a year, in midsummer (the last Saturday in January) and midwinter (the last Saturday in July), roadcounts are carried out using this standardised method. These counts are important for the conservation of these larger species that are under threat due to loss of habitat through changes in land use, increases in crop agriculture and human population densities, poisoning as well as man-made structures like power lines. With the prospect of wind and solar farms to increase the use of renewable energy sources, monitoring of these species is most important (CAR, 2020). **Figure 49** below shows that the Phase 2 Site forms part of one of the routes.

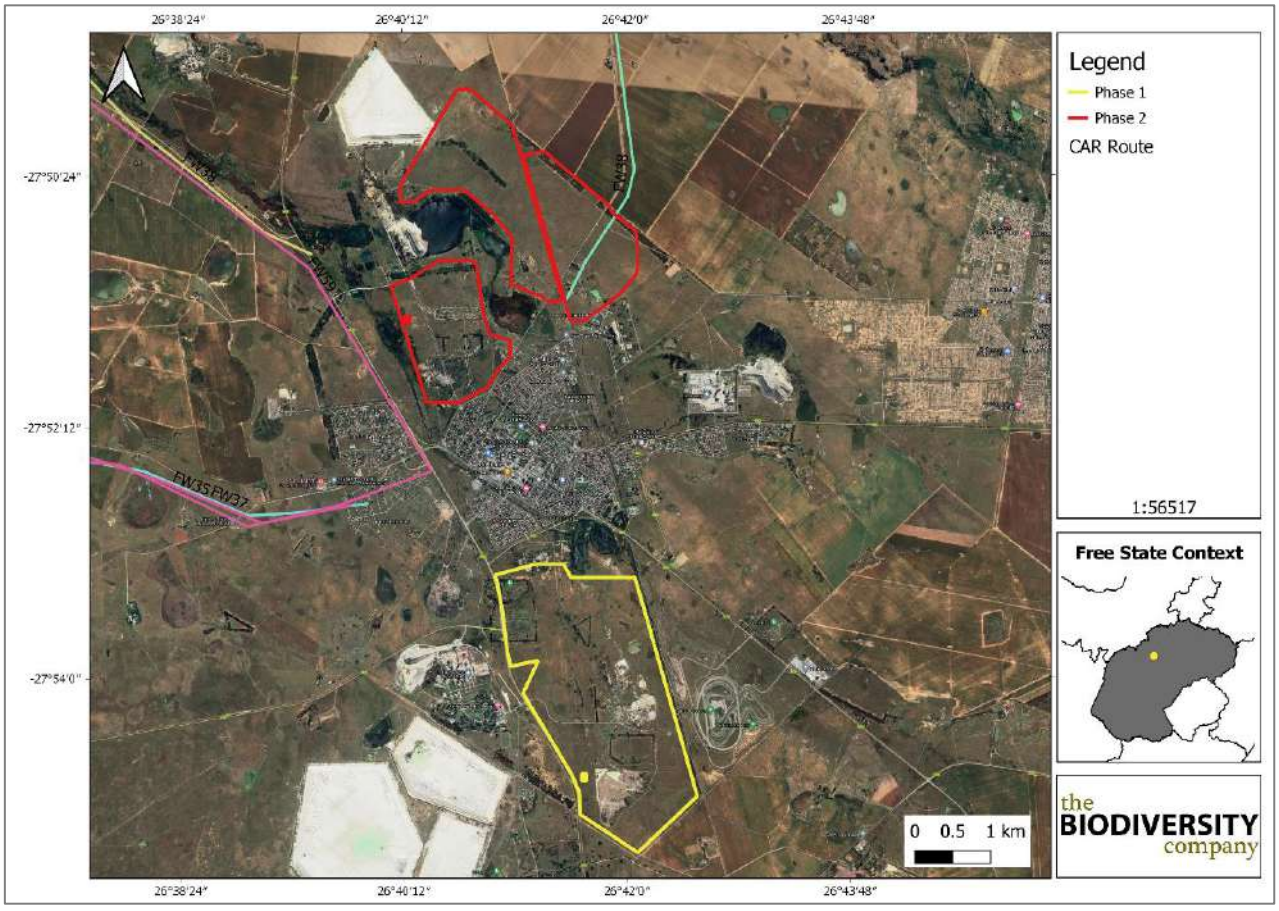


Figure 49: Project Area in relation to the Coordinated Avifaunal Roadcount route (TBC, 2020c)

Species of Conservation Concern

Based on the South African Bird Atlas Project, Version 2 (SABAP2) database, 241 bird species have the potential to occur in the vicinity of the Project area. Of the potential bird species, fifteen (15) species are listed as SCC either on a regional or global scale. These species are listed in **Table 13** below.

Table 13: List of bird species expected to occur in close vicinity to the Project Area (TBC, 2020c)

Species	Common Name	Conservation Status		Free State Species	Likelihood of Occurrence
		Regional (ESKOM, 2015)	IUCN (2020)		
Calidris ferruginea	Sandpiper, Curlew	LC	NT	Yes	High
Charadrius pallidus	Plover, Chestnut-banded	NT	NT	Yes	Moderate
Ciconia abdimii	Stork, Abdim's	NT	LC	Yes	Low
Ciconia nigra	Stork, Black	VU	LC	Yes	Low
Circus ranivorus	Marsh-harrier, African	EN	LC	Yes	High
Eupodotis caerulescens	Korhaan, Blue	LC	NT	Yes	High
Falco biarmicus	Falcon, Lanner	VU	LC	Yes	High
Falco vespertinus	Falcon, Red-footed	NT	NT	Yes	Moderate
Glareola nordmanni	Pratincole, Black-winged	NT	NT	Yes	Moderate
Mycteria ibis	Stork, Yellow-billed	EN	LC	Yes	High
Oxyura maccoa	Duck, Maccoa	NT	NT	Yes	High
Phoenicopterus minor	Flamingo, Lesser	NT	NT	Yes	High
Phoenicopterus roseus	Flamingo, Greater	NT	LC	Yes	High
Sagittarius serpentarius	Secretarybird	VU	VU	Yes	High
Sterna caspia	Tern, Caspian	VU	LC	Yes	High

Coordinated Waterbird Count

Three sites are within a 20 km radius of the Project area, namely Flamingo Pan, St Helena Mine Dams and Toronto Pan. Six SCC were identified in these counts, which are listed in **Table 14** below.

Table 14: SCC that were identified in the coordinated waterbird count (TBC, 2020c)

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2017)
Calidris ferruginea	Sandpiper, Curlew	LC	NT
Charadrius pallidus	Plover, Chestnut-banded	NT	NT
Mycteria ibis	Stork, Yellow-billed	EN	LC
Oxyura maccoa	Duck, Maccoa	NT	NT
Phoenicopterus minor	Flamingo, Lesser	NT	NT
Phoenicopterus ruber	Flamingo, Greater	NT	LC

11.8.4.2 Mammals

The IUCN Red List Spatial Data (IUCN, 2017) lists 65 mammal species that could be expected to occur within the Project area. Species generally restricted to protected areas such as game reserves were not expected to occur in the area and were removed from

the list. Of the 65 mammal species, ten (10) are listed as being of conservation concern on a regional or global basis. The list of potential species includes:

- Four (4) that are listed as VU on a regional basis; and
- Five (5) that are listed as NT on a regional scale.

On a global scale, one (1) species is listed as EN, two (2) are listed as VU and four (4) as NT (see **Table 15** below). Three (3) of the species are expected to have a low likelihood of occurrence due to a lack of suitable habitat and the proximity to urban areas and pressures.

Table 15: List of Mammal SCC that may occur in the Project area as well as their global and regional conservation statuses (TBC, 2020b)

Species	Common Name	Conservation Status		Likelihood of occurrence
		Regional (SANBI, 2016)	IUCN (2017)	
Aonyx capensis	Cape Clawless Otter	NT	NT	**High**
Atelerix frontalis	South Africa Hedgehog	NT	LC	**Moderate**
Eidolon helvum	African Straw-colored Fruit Bat	LC	NT	**Moderate**
Felis nigripes	Black-footed Cat	VU	VU	**Low**
Hydrictis maculicollis	Spotted-necked Otter	VU	NT	**High**
Leptailurus serval	Serval	NT	LC	**High**
Mystromys albicaudatus	White-tailed Rat	VU	EN	**High**
Panthera pardus	Leopard	VU	VU	**Low**
Parahyaena brunnea	Brown Hyaena	NT	NT	**Low**
Poecilogale albinucha	African Striped Weasel	NT	LC	**High**

11.8.4.3 Herpetofauna (Reptiles & Amphibians)

Based on the IUCN Red List Spatial Data (IUCN, 2017) and the ReptileMap database provided by the Animal Demography Unit (ADU, 2019) 31 reptile species have the potential to occur in the Project area. One (1) of the expected species is a SCC (IUCN, 2017), which is *Smaug giganteus* (Giant Dragon Lizard). This species is categorised as vulnerable on both a regional and an international scale. It is endemic to South Africa, where it is found only in the grasslands of the northern Free State and the southwestern parts of Mpumalanga (IUCN, 2017). Habitat loss due to agriculture is a continuing threat. Large portions of the grassland habitat are underlain by coal beds of varying quality and extent, and exploitation of coal for fuel has and will result in further habitat loss. The likelihood of finding the species in the Project area is moderate, based on the ADU ReptileMap 13 records of this species has been made in in this QDS, these records were however from 2013 and 2005 it is therefore likely that this species is not present in the area anymore.

Based on the IUCN Red List Spatial Data (IUCN, 2017) and the AmphibianMap database provided by the Animal Demography Unit (ADU, 2020) 17 amphibian species have the

potential to occur in the Project area. No amphibian SCCs are expected to occur in the project area.

11.8.5 Protected Areas

Figure 50 below shows that the Project area is more than 10 km away from the Newlands and Thabong Nature Reserves.

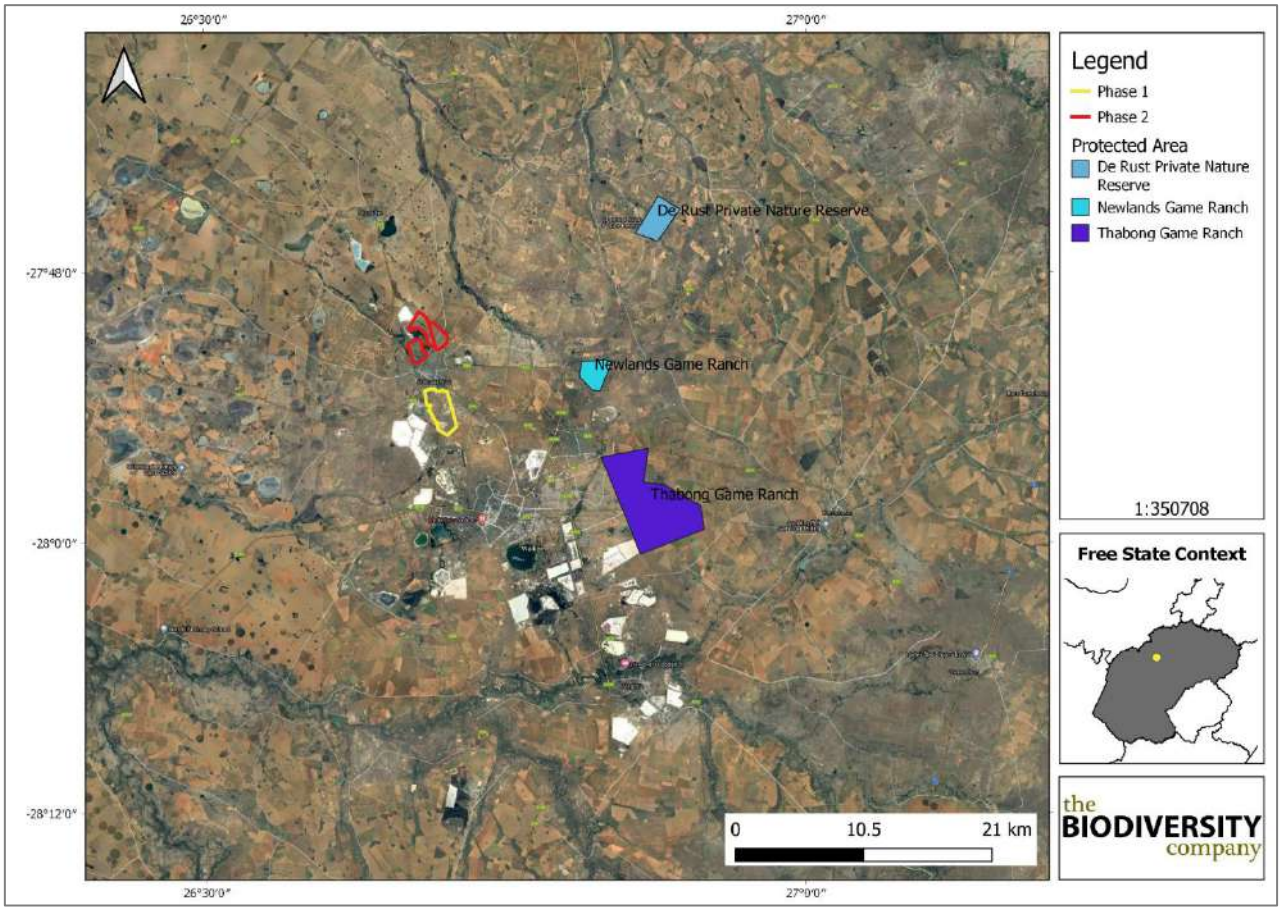


Figure 50: Protected Areas in relation to the Project Area (SAPAD, 2018; SACAD, 2018) (TBC, 2020c)

11.9 Socio-Economic Environment

11.9.1 General

According to the 2019 - 2020 IDP for the MLM, key features of the MLM include the following:

- MLM is a category B municipality established in terms of Section 12 of the Municipal Structures Act (117 of 1998);
- The municipality covers an area of 514.4 km^2 consisting of Welkom, Odendaalsrus, Allanridge, Hennenman, Virginia and Ventersburg;
- The municipality has a total of 116,712 proclaimed stands for both residential purpose;
- The rural areas of MLM cover an area of approximately 2500 farms; and

- MLM is the largest municipality in the District and it contains most of the mining activities, especially gold mining. Recently the mining sector has been on a downward trend as a result of closure of many of the shafts as a result of high costs of production among others and the need for deep mining. The recent decline in world commodity prices, has aggravated the situation in general with many businesses that have traditionally dependent on the mining sector either have closed down or are in the process of closing down.

According to MetroGIS (2015), the sites earmarked for the Project are located within an area that has a distinct rural character. The agricultural areas are interspersed with gold mining operations that are predominantly concentrated between Welkom and Odendaalsrus, and northwards towards Allanridge.

A map showing sub places and the municipal wards is provided in **Figure 51** below. The Phase 1 Site is located in Ward 35 and the Phase 2 Site falls within Ward 36.

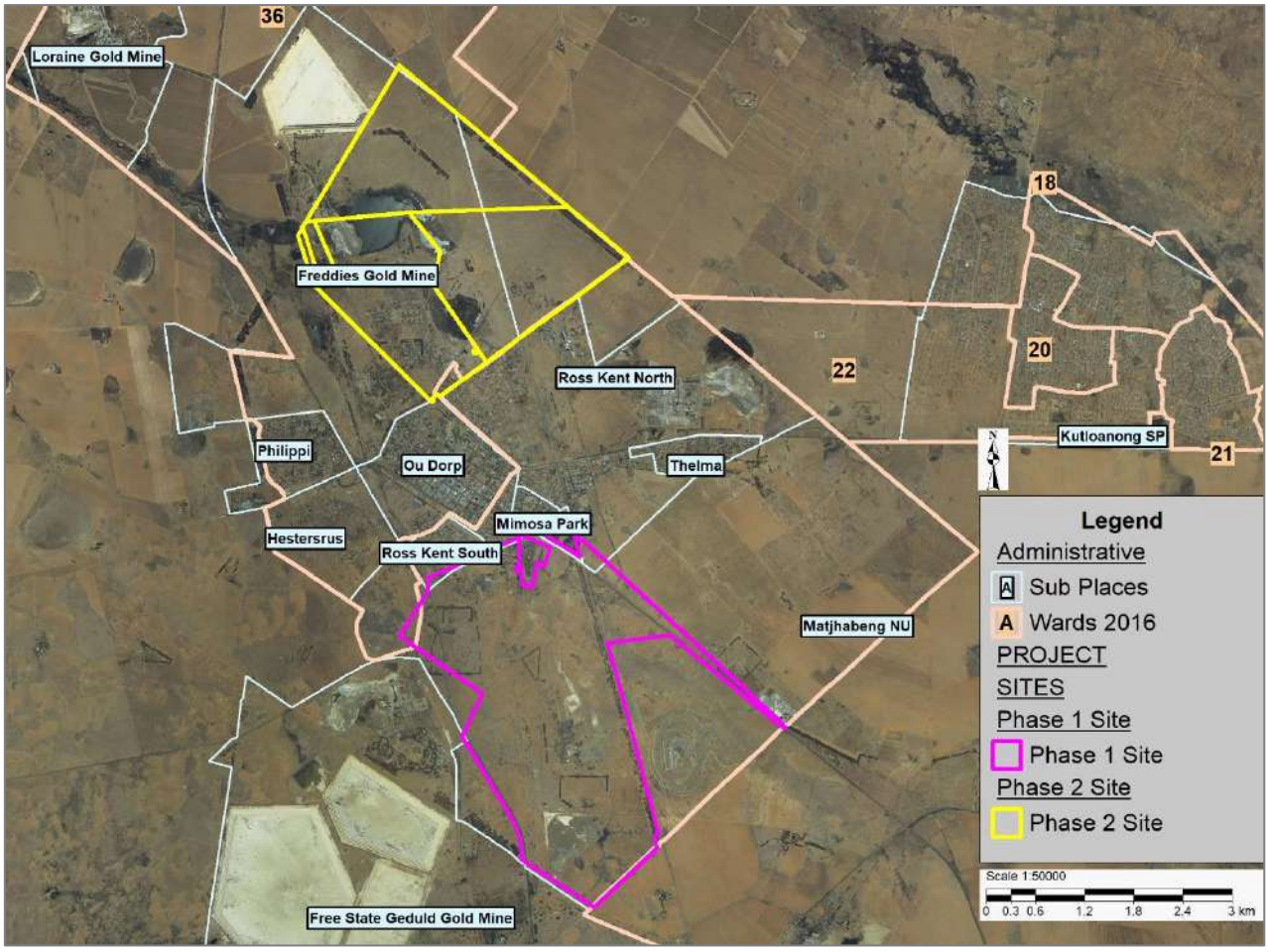


Figure 51: Sub places and the municipal wards

The proposed Project Sites have been secured and the MLM has entered into a Long-Term Land Lease Agreement with the Applicant. Although there is an existing mining right by Harmony Gold Mining Company Ltd on the area in question, a consent letter was received from the mining

company. There is also a Tripartite and Rehabilitation Agreement between Harmony Gold Mining Company Ltd, MLM and the Applicant related to the rehabilitation obligations.

Certain informal uses of the land are taking place, including the grazing of livestock (refer to **Figure 52** below) and informal settling (refer to **Figure 53** below). People are also still residing within the old mining houses on the PV sites (refer to **Figure 54** below).

Figure 52: Informal grazing of livestock on Phase 2 Site

Figure 53: Informal dwellings on Phase 1 Site

Figure 54: Old mining houses being occupied (van Schalkwyk, 2015)

11.9.2 Settlement Patterns

The population density for the larger part of the study area (i.e. the agricultural land) is less than 4 people per km^2. Residents within this area are primarily located at homesteads/farmsteads that are scattered throughout the region. Higher population densities occur at the towns and built-up areas of Allanridge, Odendaalsrus, Kutloanong and Welkom (exceeding 600 people per km^2) (MetroGIS, 2015).

11.9.3 Socio-Economic Baseline

The information to follow was sourced from the previous Scoping Report (JIS Environmental Engineers, 2019).

11.9.3.1 Population

According to Statistics 2011, the population of MLM is 406,461. There was a slight decline in the population growth (see **Table 16** below), which can be attributed to a number of factors such as migration due to the diminishing mining activities and HIV/AIDS, amongst others. **Table 17** below shows the population groups in the MLM.

Table 16: Population Growth Rate (Stats SA 2011)

Gender	2011	%	2001	%
Male	201 509	49.6	200 370	49.1
Female	204 952	50.4	207 799	50.9
Total	**406 461**	**100**	**408 169**	**100**

Table 17: Population groups within the MLM (Stats SA 2011)

	Male	Female	Total
Black	180 913	182 467	363 380
Coloured	2 623	2729	5 352
Indian or Asian	766	470	1 236
White	17 613	17 451	35 064
Total	**203 915**	**205 117**	**406 461**

11.9.3.2 Economic Activities

Table 18 below shows the employment levels within MLM in all economic sectors. The table shows both growth and decline from one sector to the other. Of importance to note, is a decline of mining and quarrying sector and agriculture while other sectors have shown growth. The Project intends to promote economic growth.

Table 18: Employment by sector (Stats SA 2011)

Sector	2009	2010	2011	%
Agriculture, forestry and fishing	358	339	381	1.4
Mining and quarrying	7087	10629	11495	42.8
Manufacturing	1332	1342	1429	5.3
Electricity, gas and water	418	502	556	2.1
Construction	442	493	549	2.0
Wholesale and retail trade, catering and accommodation	2162	2479	2793	10.4
Transport, storage and communication	1059	1096	1183	4.4
Finance, insurance, real estate and business services	2472	2737	2943	11.0
Community, social and personal services	2080	2562	2852	10.6
General government	2043	2343	2692	10.0
Total	**19452**	**24522**	**26873**	**100**

The annual household income in MLM is shown in **Table 19** below.

Table 19: Annual household income (Stats SA 2011)

Annual Household Income	2011	%	2001	%
No income	20 069	16.3	35 646	27.7
R 1 - R 4800	6 606	5.4	12 072	9.4
R 4801 - R 9600	9 081	7.4	19 196	14.9
R 9601 - R 19 600	21 416	17.4	24 583	19.1
R 19 601 - R 38 200	22 394	18.2	17 985	14
R 38 201 - R 76 400	18 854	15.3	9 293	7.2
R 76 401 - R 153 800	11 703	9.5	6 152	4.8
R 153 801 - R 307 600	7973	6.5	2674	2.1
R 307 601 - R 614 400	3 789	3.1	614	0.5
R 614 001 - R 1 228 800	858	0.7	172	0.1
R 1 228 801 - R 2 457 600	262	0.2	149	0.1
R 2 457 601 or more	188	0.2	104	0.1
Unspecified	1	0.001	-	-
Total	**123 195**	**100**	**128 640**	**100**

11.9.3.3 Education levels

Education levels in MLM are shown in **Table 20** below. There has been considerable progress towards higher education levels since 2001. The proportion of persons with no schooling has dropped from 11.3% to 4%. This has important implications for employment.

Table 20: Education levels (Stats SA 2011)

Education Level	2011	%	2001	%
Grade 0	10 973	2.7	-	-
Grade 1 / Sub A	10 651	2.6	16 074	3.9
Grade 2 / Sub B	10 713	2.6	12 395	3.0
Grade 3 / Std 1/ABET 1	11 206	2.8	16 522	4.0
Grade 4 / Std 2	13 989	3.4	20 957	5.1
Grade 5 / Std 3/ABET 2	14 659	3.6	22 160	5.4
Grade 6 / Std 4	17 170	4.2	25 846	6.3
Grade 7 / Std 5/ ABET 3	21 155	5.2	31 422	7.7
Grade 8 / Std 6 / Form 1	32 268	7.9	34 324	8.4
Grade 9 / Std 7 / Form 2/ABET 4	26 433	6.5	26 826	6.6
Grade 10 / Std 8 / Form 3	37 178	9.1	33 535	8.2
Grade 11 / Std 9 / Form 4	31 023	7.6	22 084	5.4
Grade 12 / Std 10 / Form 5	73 537	18.1	47 387	11.6
NTC 1-6	5 155	1.3	0	0
Certificate with less than Grade 12 / Std 10	3 97	0.1	912	0.2
Diploma with less than Grade 12 / Std 10	448	0.1	505	0.1
Certificate with Grade 12 / Std 10	3 529	0.9	4 527	1.1
Diploma with Grade 12 / Std 10	4 624	1.1	6 062	1.5
Higher Diploma	4 255	1.0	-	-
Post Higher Diploma Masters; Doctoral Diploma	700	0.2	-	-
Bachelors Degree	2 789	0.7	2 066	0.5
Bachelors Degree and Post graduate Diploma	1 022	0.3	849	0.2
Honours degree	1 325	0.3	446	0.1
Higher Degree Masters / PhD	685	0.2	378	0.1
Other	661	0.2	-	-
No schooling	16 172	4	46 157	11.3
Not applicable	53 741	13.2	36 735	9.0
Total	**406 461**	**100**	**408 167**	**100**

11.10 Planning

The map of MLM's spatial vision, which forms part of the municipal SDF, is shown in **Figure 55** below. The following is noted with regards to the Project's location in relation to the MLM's spatial vision:

- Phase 1 Site –future land use shown as "future urban development"; and
- Phase 2 Site – existing land use indicated as "commonage", with no future land use designation.

A map showing sub places and the municipal wards is provided in **Figure 51** above. The Phase 1 Site is located in Ward 35 and the Phase 2 Site falls within Ward 36.

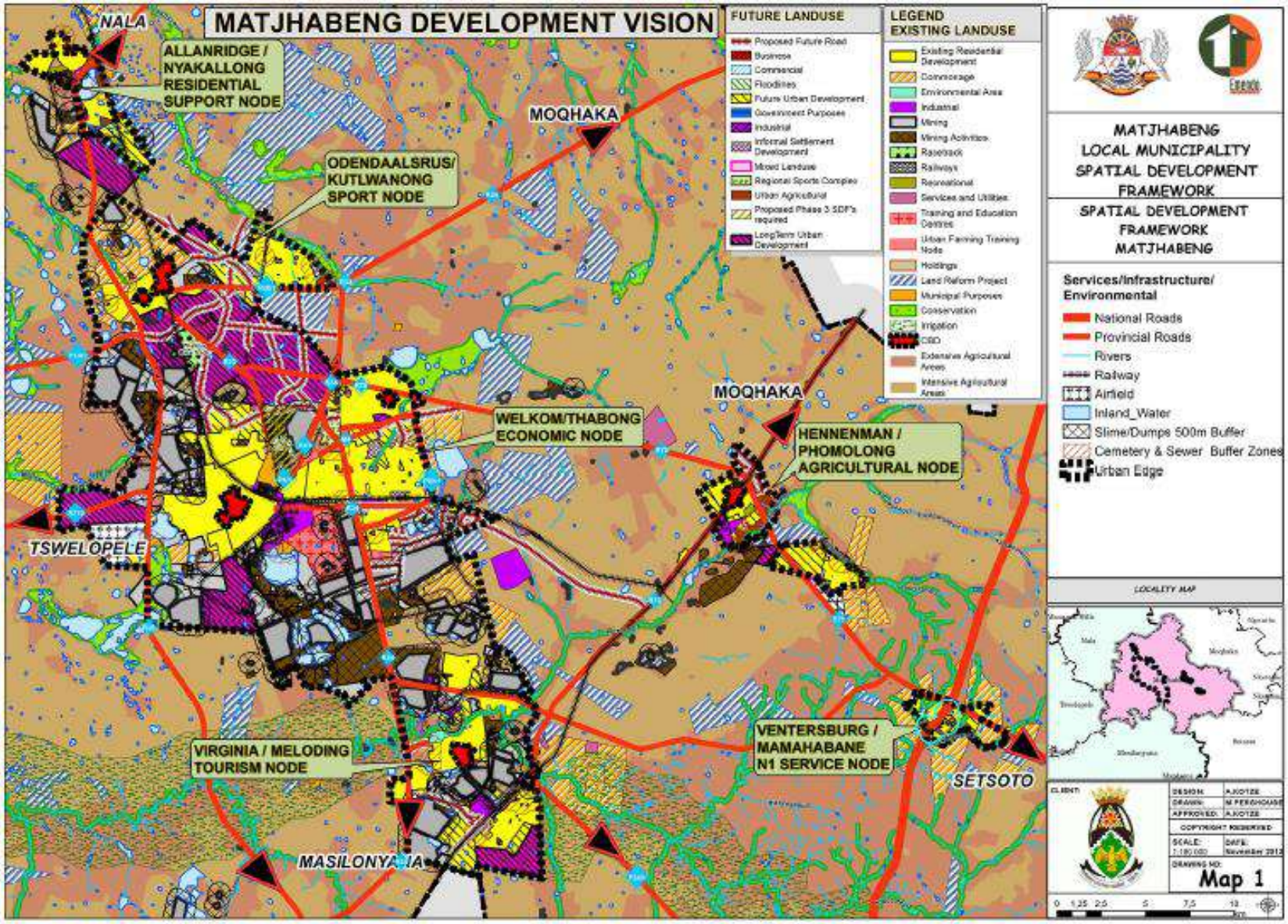


Figure 55: MLM SDF

11.11 Existing Structures and Infrastructure

The following is noted with regards to existing structures and infrastructure that occur within the Project's sites or near their boundaries:

- Phase 1 Site –
  - Structures and infrastructure related to the previous mining activities are present on the site (see **Figure 56** below). Of these, the vent shaft and sub-station (see **Figure 57** below) are still operational and will remain;
  - The R70 runs along the north-eastern part of the site (see **Figure 58** below) and traverses a small section of the north-western part of the overall site;
  - The R30 runs along the western part of the site (see **Figure 59** below) and traverses a small section of the north-western part of the overall property;
  - The R34 (Findley Ave) runs along the north-western boundary of the site (see **Figure 60** below);
  - The S289 gravel road runs to the south of the site (see **Figure 61** below);
  - A regional railway line runs along the south-eastern part of the site and traverses the north-eastern part of the overall property (see **Figure 62** below);
  - A water pipeline runs along the eastern part of the site;
  - Powerlines traverse the site;
  - Internal access roads associated with the previous land uses traverse the site; and
  - Refer also to features shown in **Figure 31** above.

Figure 56: Old mining administration block – Phase 1 Site (van Schalkwyk, 2015)

Figure 57: Vent shaft and sub-station – Phase 1 Site

Figure 58: North-western view along the R70 (primary site located to the left) (Google Earth image)

Figure 59: Northern view along the R30 (site located to the right)

Figure 60: South-eastern view along the R34 (site located to the left) (Google Earth image)

Figure 61: North-eastern view along the S289 gravel road

Figure 62: Southern view along the railway line (primary site located to the right)

❖ Phase 2 Site –

- Structures and infrastructure related to the previous mining activities are present on the site (see **Figure 63** below);
- A regional railway line traverses the eastern-central part of the overall site (see **Figure 64** below);
- The primary access road to the site is from the R30, which runs to the west of the site (see **Figure 65** below);
- The A48 / S86 road traverses the site (see **Figure 66** below);
- Powerlines traverse the site;
- A furrow / canal traverses the site;
- Internal access roads associated with the previous land uses traverse the site; and
- Refer also to features shown in **Figure 33** above.

Figure 63: **Old mining administration block – Phase 2 Site (van Schalkwyk, 2015)**

Figure 64: **North-western view along the railway line (site located on both sides of the railway lines)**

Figure 65: **Northern view along the R33 (main access to site located to the left) (Google Earth image)**

Figure 66: **North-eastern view along the A48 / S86 road (site located on both sides of the road)**

Apart from the abovementioned infrastructure, there is a possibility that other infrastructure may also occur on the sites, which will be identified as part of the design phase. Various organisations and custodians of infrastructure, for example Eskom, Transnet, Telkom, SANRAL and the Free State Department of Police, Roads and Transport (DPRT) were also notified during the public participation process.

11.12 Transportation

Based on the Traffic Impact Assessment (KMA Consulting Engineers, 2020), the most important roads in the area are the following (as shown in **Figure 67** below):

- R30 (P1/2 & P43/3) –
  - This road connects Bloemfontein with Rustenburg via Brandfort, Odendaalsrus, Klerksdorp and Ventersdorp. The road is in general a two lane undivided road.

- A48 / S86 –
  - This Provincial road links Odendaalsrus with the R30 to the north of the town. The road extends Hauptfleish Street in the town. The road is a paved road becoming a gravel road to the north.
- Other Roads –
  - Most other potentially affected roads are urban streets in the Odendaalsrus Urban Area. Most streets are two-lane undivided local streets.

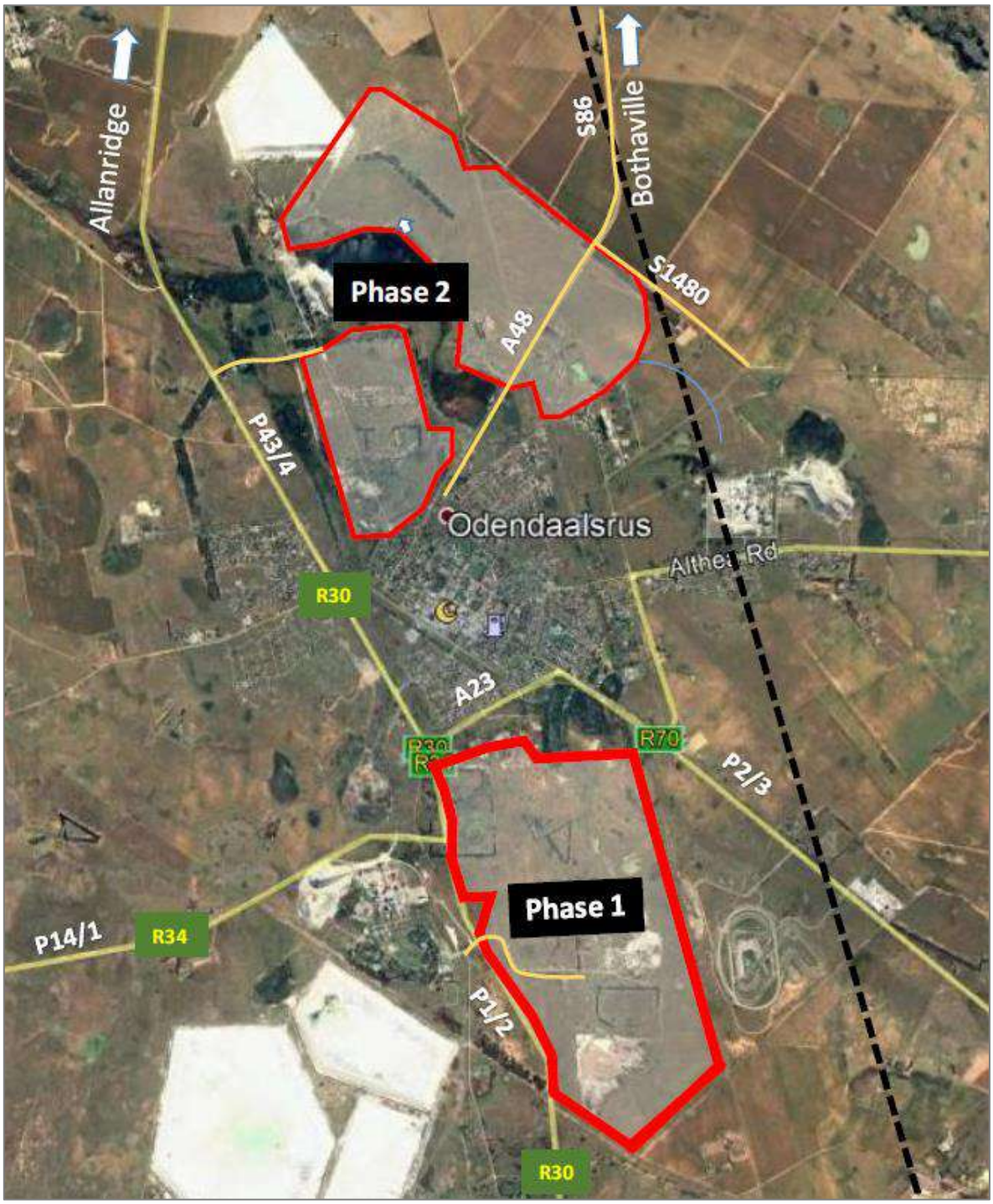


Figure 67: Road network (KMA Consulting Engineers, 2020)

A regional railway line traverses both sites. The Welkom Airport is located approximately 9 km to the south-west of the Phase 1 Site.

11.13 Air quality

Potential sources of air pollution in the region include the following:

- Stack, vent and fugitive dust emissions from existing mining operations, as well as windblown dust emissions from tailings storage facilities;
- Fugitive dust emissions from agricultural activities;
- Vehicle exhaust emissions from vehicles traveling on paved and unpaved roads, including on the R30 regional road as well as on roads inside the settlements of Allanridge, Nyakallong, Kutlwanong and Odendaalsrus;
- Biomass burning (veld fires);
- Domestic fuel burning;
- Industrial operations;
- Waste treatment and disposal;
- Other fugitive dust sources such as wind erosion from exposed areas.

11.14 Noise

In terms of the local acoustical environment, the background noise levels are expected to be typical of a rural area.

Noise in the greater area emanates primarily from mining activities, farming operations (e.g. use of farming equipment), vehicles on the surrounding road network, racing events at the Phakisa Freeway circuit, human activities in surrounding settlements and trains passing on the railway.

11.15 Cultural Heritage & Palaeontological Features

11.15.1 Cultural Heritage

The information to follow was obtained from the Cultural Heritage Impact Assessment (van Schalkwyk, 2020) (contained in **Appendix H5**). Refer to **Sections 12.7** and **13.16** for a synopsis of the study and a related impact assessment, respectively.

The cultural landscape qualities of the region essentially consist of two components. The first is a rural area in which the human occupation is made up of a very limited pre-colonial Stone Age and Iron Age occupation. The second and much later component is a colonial farmer one, with a very limited urban component consisting of a number of smaller towns, most of which developed during the last 100 to 120 years.

Some observations from a site-specific assessment are as follows:

- The study area formed part of the Free State Geduld Mine. The Free State or Welkom gold field came into being in 1945 when a mining lease was granted to the St Helena Gold Mine. Eventually the gold field consisted of some 20 mines that were exploiting five principal ore bodies. Eventually, they were amalgamated into larger and more cost-effective units, of which Free State Geduld is one unit of the larger Freegold North mine (Robb & Robb, 1998). Due to the intensive mining activities, the remains of mining related infrastructure occur on both PV sites (see **Figure 68** below).
- Phase 1 and Phase 2 Sites - From the aerial photograph dating to 1944 it can be seen that no development occurred in the Project area prior to the mining been developed. On the 1952 version of the 1:50 000 topographic map the rapid development of the mining activities can be seen.

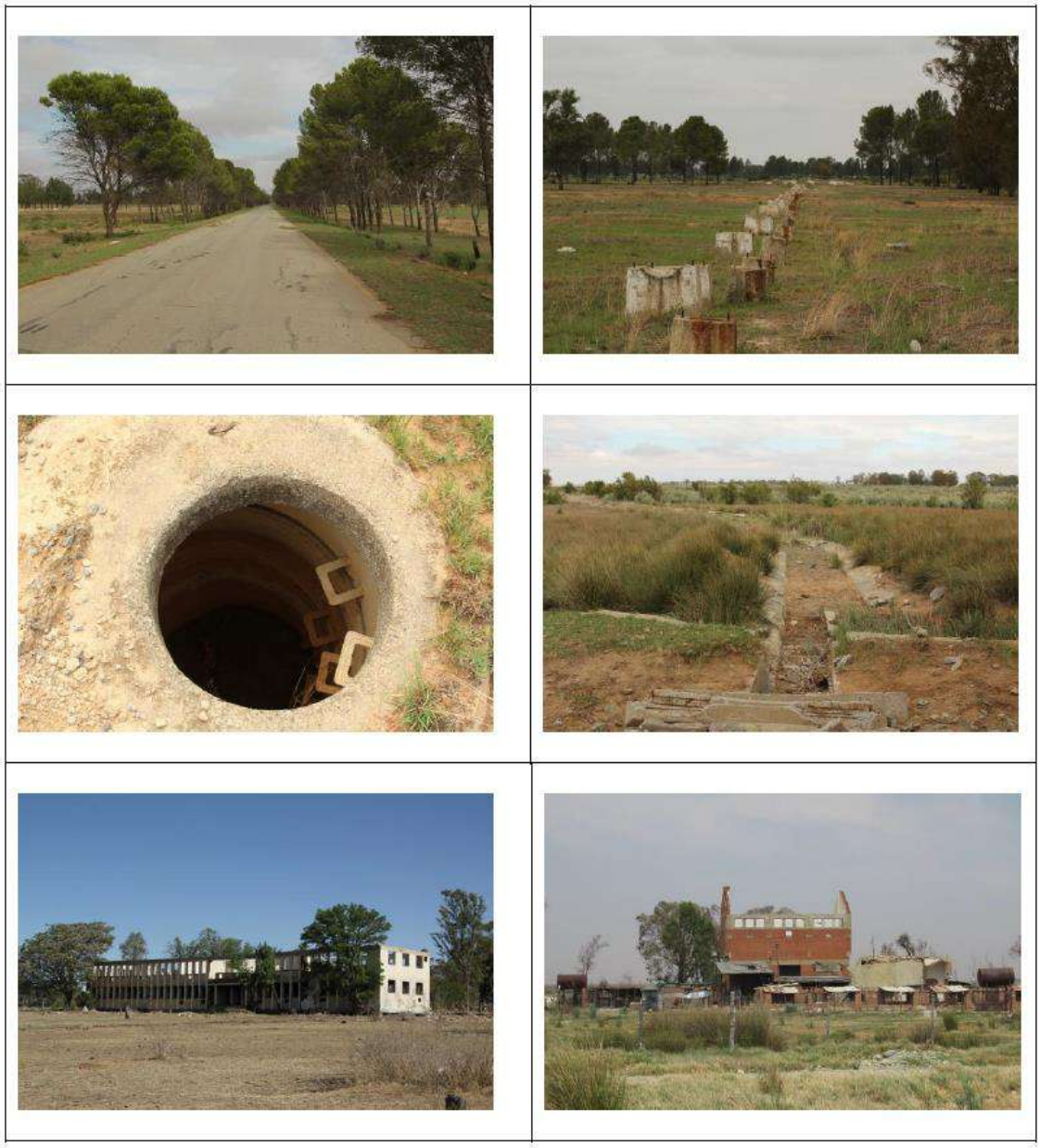
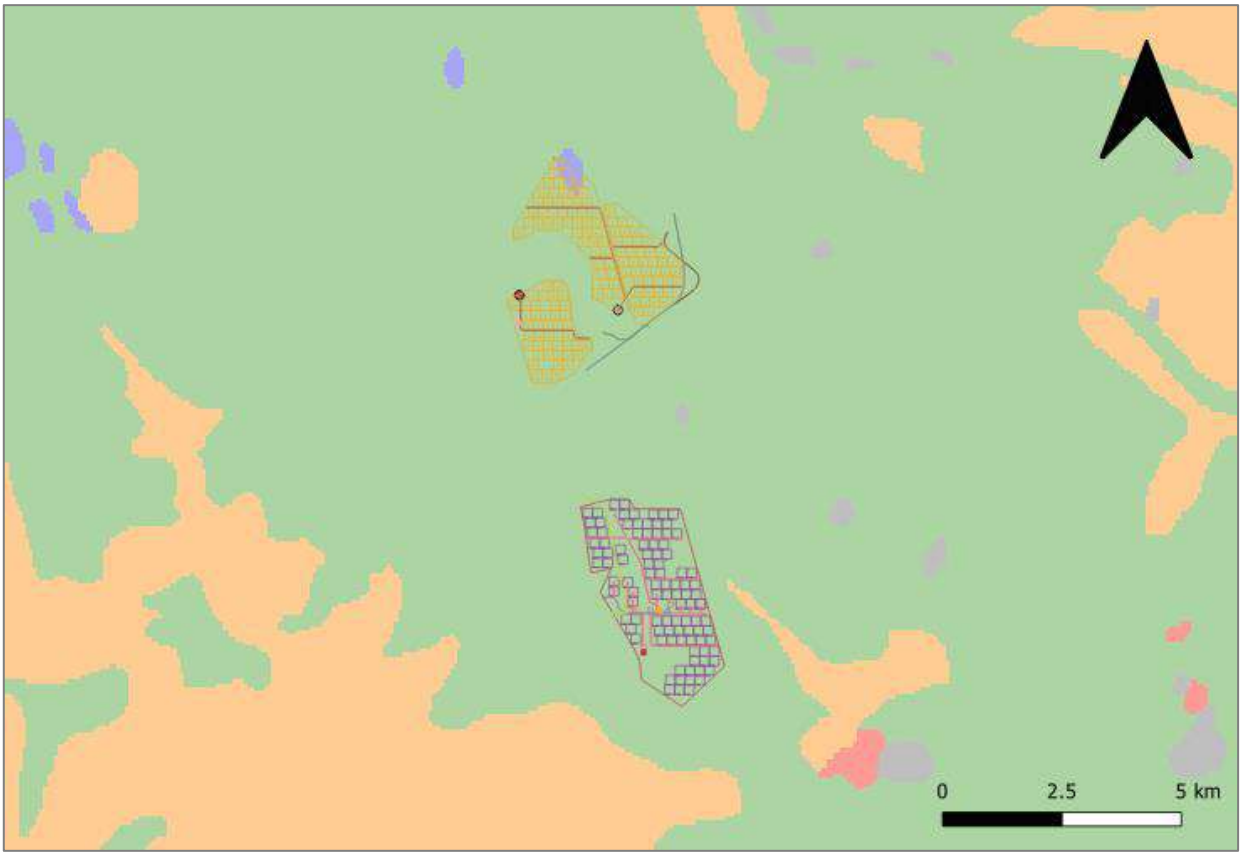


Figure 68: The remains of mining related infrastructure (van Schalkwyk, 2020)

11.15.2 Palaeontological Features

The information to follow was obtained from Desktop Paleontological Assessment (Banzai Environmental, 2020) (contained in **Appendix H6**).

According to the South African Heritage Resources Information System (SAHRIS) Palaeosensitivity Map (shown in **Figure 69** below), there is a moderate chance of finding fossils in the Project area.



Colour	Sensitivity	Required Action
RED	VERY HIGH	field assessment and protocol for finds is required
ORANGE/YELLOW	HIGH	desktop study is required and based on the outcome of the desktop study; a field assessment is likely
GREEN	**MODERATE**	**desktop study is required**
BLUE	LOW	no palaeontological studies are required however a protocol for finds is required
GREY	INSIGNIFICANT/ZERO	no palaeontological studies are required
WHITE/CLEAR	UNKNOWN	these areas will require a minimum of a desktop study. As more information comes to light, SAHRA will continue to populate the map.

Figure 69: Extract of the 1 in 250 000 SAHRIS PalaeoMap map (Council of Geosciences) (Banzai Environmental, 2020)

11.16 Aesthetic Qualities

The information to follow was obtained from the Visual Impact Assessment (SAS, 2020) (contained in **Appendix H8**). Refer to **Sections 12.9** and **13.17** for a synopsis of the study and a related impact assessment, respectively.

The sense of place associated with the proposed Project Sites is related to the landscape character type, defined as semi-rural, with settlements / villages interspersed, relatively flat terrain dominated by grassland and agricultural activities where cattle grazing and mining activities are taking place.

The proposed Project Sites and immediate surrounds can further be described as calm, tranquil and peaceful. The sense of place is however not unique to the proposed Project Sites as it extends to the larger Free State region. As the landscape is already accustomed to mand-made structures such as mining activities, existing overhead powerlines and substations, the proposed Project will not have a significant effect on the sense of place of the area.

11.17 Health

11.17.1 Health Care Facilities

Health care facilities in Odendaalsrus include the Thusanong District Hospital and Bophelong Clinic.

11.17.2 Health Risks

The primary health risks identified for the sites are associated with the previous mining activities, which include mining infrastructure, excavations and other land disturbances, dump sites and contamination (refer to **Section 11.2.2** above regarding radiological sources).

12 SUMMARY OF SPECIALIST STUDIES

12.1 Specialist Studies undertaken as part of the EIA

A crucial element of the Plan of Study for the EIA prepared during the Scoping phase was to provide the Terms of Reference for the requisite specialist studies triggered during Scoping. According to Münster (2005), a 'trigger' is "*a particular characteristic of either the receiving environment or the proposed project which indicates that there is likely to be an issue and/or potentially significant impact associated with that proposed development that may require specialist input*". The requisite specialist studies 'triggered' by the findings of the Scoping process, aimed at addressing the key issues and compliance with legal obligations, include:

1. Water Resources Impact Assessment;
2. Terrestrial Ecology Assessment;
3. Avifaunal Assessment;
4. Agricultural Impact Assessment;
5. Phase 1 Cultural Heritage Impact Assessment;
6. Desktop Paleontological Assessment;
7. Visual Impact Assessment;
8. Traffic Impact Assessment;
9. Radiological Survey; and
10. Socio-Economic Impact Assessment.

The Applicant had previously initiated an EIA for the Project, which did not progress beyond the Scoping Phase. Information pertaining to the environmental baseline, which was contained in the previous Scoping Report (JIS Environmental Engineers, 2019), was obtained from the following scoping-level specialist studies (contained in the Scoping Report under the current application):

- Biodiversity Assessment;
- Visual Assessment;
- Cultural Heritage Impact Assessment;
- Preliminary Desktop Agricultural Study;
- Wetland Scoping Study;
- Social Impact Assessment; and
- Radiological Survey.

12.2 Incorporating the Findings from Specialist Studies

The *Guideline for the review of specialist input in EIA processes* (Keatimilwe & Ashton, 2005) was used for including the findings of the specialist studies into the EIA Report. Key considerations included the following:

- Ensuring that the specialists have adequately addressed IAPs' issues and specific requirements prescribed by environmental authorities;

- ❖ Ensuring that the specialists' input is relevant, appropriate and unambiguous; and
- ❖ Verifying that information regarding the receiving ecological, social and economic environment has been accurately reflected and considered.

The information obtained from the respective specialist studies was incorporated into the EIA Report in the following manner:

6. The assumptions and limitations identified in each study were included in **Section 7** above;
7. The information was used to complete the description of the receiving environment (**Section 11**) in a more detailed and site-specific manner;
8. A summary of each specialist study is contained in the sub-sections to follow (**Sections 12.3 – 12.12** below), focusing on the approach to each study, key findings and conclusions drawn;
9. The specialists' impacts assessment, and the identified mitigation measures, were included in the overall project impact assessment contained in **Section 13** below;
10. The evaluations performed by the specialists on the alternatives were included in the analysis (**Section 14** below) to identify the most favourable option;
11. Specialist input was obtained to address comments made by IAPs that related to specific environmental features pertaining to each specialist discipline; and
12. Salient recommendations made by the specialists were taken forward to the final EIA Conclusions (**Section 16**).

Refer to **Appendix H11** for declarations from the respective specialists.

12.3 Water Resources Impact Assessment

A summary of the Water Resources Impact Assessment (TBC, 2020a) (contained in **Appendix H1**) follows.

12.3.1 Details of the Specialist

The details of the specialist that undertook the Water Resources Impact Assessment follow.

Organisation:	The Biodiversity Company
Name:	A. Husted
Qualifications:	MSc Aquatic Health
Affiliation (if applicable):	South African Council for Natural Scientific Professions (SACNASP) Professional Natural Scientist (Registration No.: 400213/11)

12.3.2 Objectives of the Study

The following tasks were completed in fulfilment of the terms of reference for this study:

- Review existing desktop information and literature;
- Determine the integrity and functionality of the water resources;
- Undertake an impact assessment for the proposed activities; and
- Prescribe mitigation measures and provide recommendations for the identified risks.

12.3.3 Methodology

The assessment included the following tasks (amongst others):

- Identification and mapping of wetlands. The National Wetland Classification Systems (NWCS) developed by the South African National Biodiversity Institute (SANBI) was considered for this study. The wetland areas were delineated in accordance with the guideline: *A practical field procedure for identification and delineation of wetlands and riparian areas* (DWAF, 2005).
- Determining the Present Ecological Status (PES);
- Determining the Ecological Importance and Sensitivity (EIS); and
- Determining buffer requirements.

A survey was conducted in early November 2020, which constitutes a wet season assessment.

12.3.4 Key Findings of the Study

A description of the surface water features in the Project area is contained in **Section 11.7** above.

Key findings from the study follow.

12.3.4.1 Wetland Classification

Based on a combination of desktop and in-field delineations, a total of 29 and 9 individual natural wetland hydrogeomorphic (HGM) units were identified and delineated for the Phase 1 and Phase 2 Sites, respectively. One non-HGM type is associated with Phase 1, namely a dam. The dams are regarded as artificial systems and have been delineated for the purposes of the study, but no further ecological or functional assessment was undertaken for these systems. Photographs of some of the HGM types identified for the study are presented in **Figure 70** below.

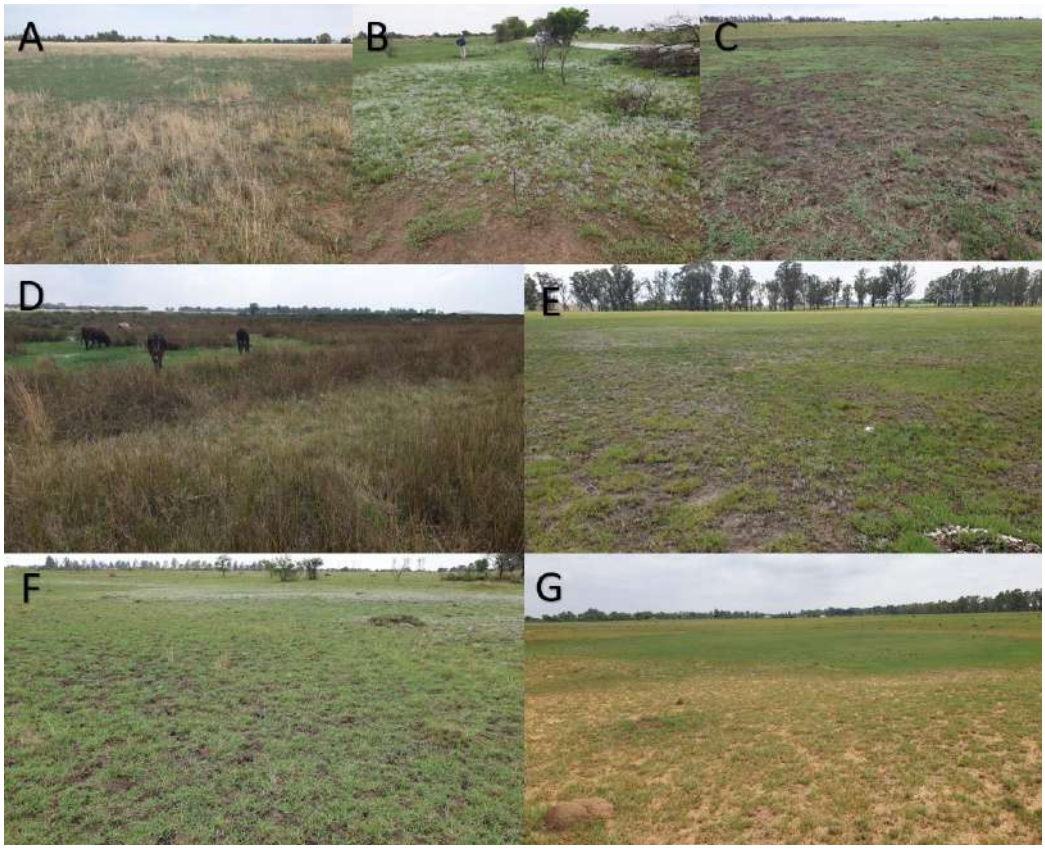


Figure 70: **Photographs of wetlands identified for the assessment A & B) Depression, C) Seep, D) Unchanneled valley bottom, E, F & G) Depression (TBC, 2020a)**

A waterlogged area was also delineated for the Phase 2 Site, and this area was also identified and delineated by the soil study (see **Figure 71** below). This area has not been characterised as a natural wetland and is regarded as artificial, and the extent of inundation is largely attributed to water stemming for the mine workings to the south of the project area.

Figure 71: **Photographs of the waterlogged area and input (top-left) (TBC, 2020a)**

The location and extent of the delineated wetland systems are presented in **Figure 72** and **Figure 73** below. Each wetland was classified following the national wetland classification system (level 1-4) into one of six main types (see **Table 21** below). These included depressions, seepage wetlands and unchanneled valley bottom system. Together these wetlands occupied a total of 91.68 ha and 15.89 ha within the Phase 1 and Phase 2 Sites, respectively.

Table 21: Wetland classification as per SANBI guideline (Ollis *et al.*, 2013) (TBC, 2020a)

Wetlands (n)	Area (ha)	Level 1	Level 2		Level 3	Level 4		
		System	DWS Ecoregion/s	NFEPA Wet Veg Group/s	Land-scape Unit	4A (HGM)	4B	4C
Phase 1								
5	10.94	Inland	Highveld	Dry Highveld Grasslands Group 3	Slope	Seep	With and without channeled outflow	N/A
24	80.73				Bench	Depression	Endorheic	Without outflow
Phase 2								
1	2.83	Inland	Highveld	Dry Highveld Grasslands Group 3	Slope	Seep	With and without channeled outflow	N/A
6	4.1				Bench	Depression	Endorheic	Without outflow
2	8.96				Valley-bottom	Unchanneled valley-bottom	N/A	N/A

12.3.4.1 Wetland Health

It was found that most of the wetland systems within the Project area are classified as class C (Moderately Modified) followed by class E (Seriously Modified), and class D (Largely Modified) systems are similar. The wetland areas for both sites are predominantly in a Largely Modified state. These modifications reflect the prevailing land uses, which comprise of mining activities and cultivated land.

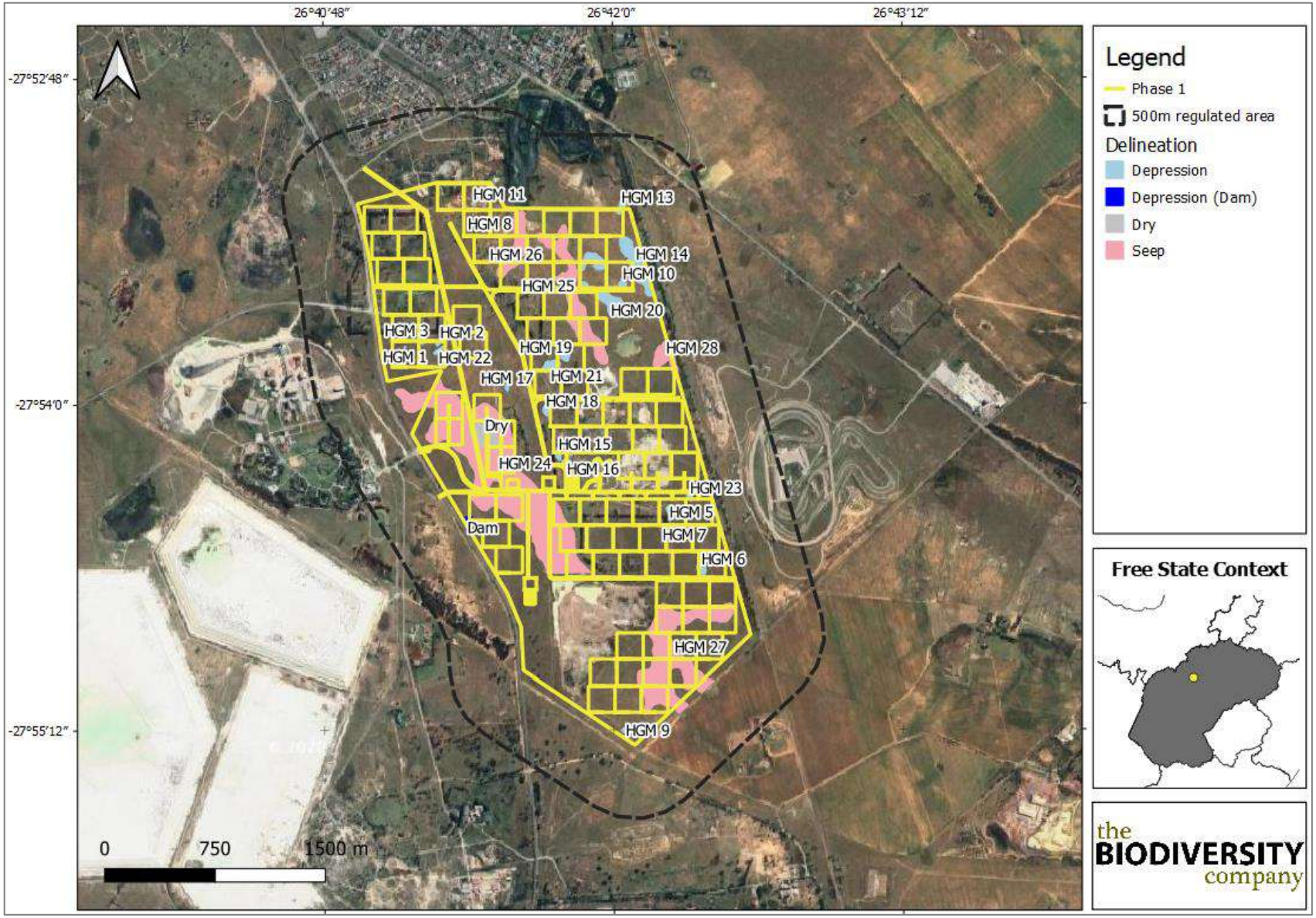


Figure 72: **Wetland delineation for Phase 1 Site (TBC, 2020a)**

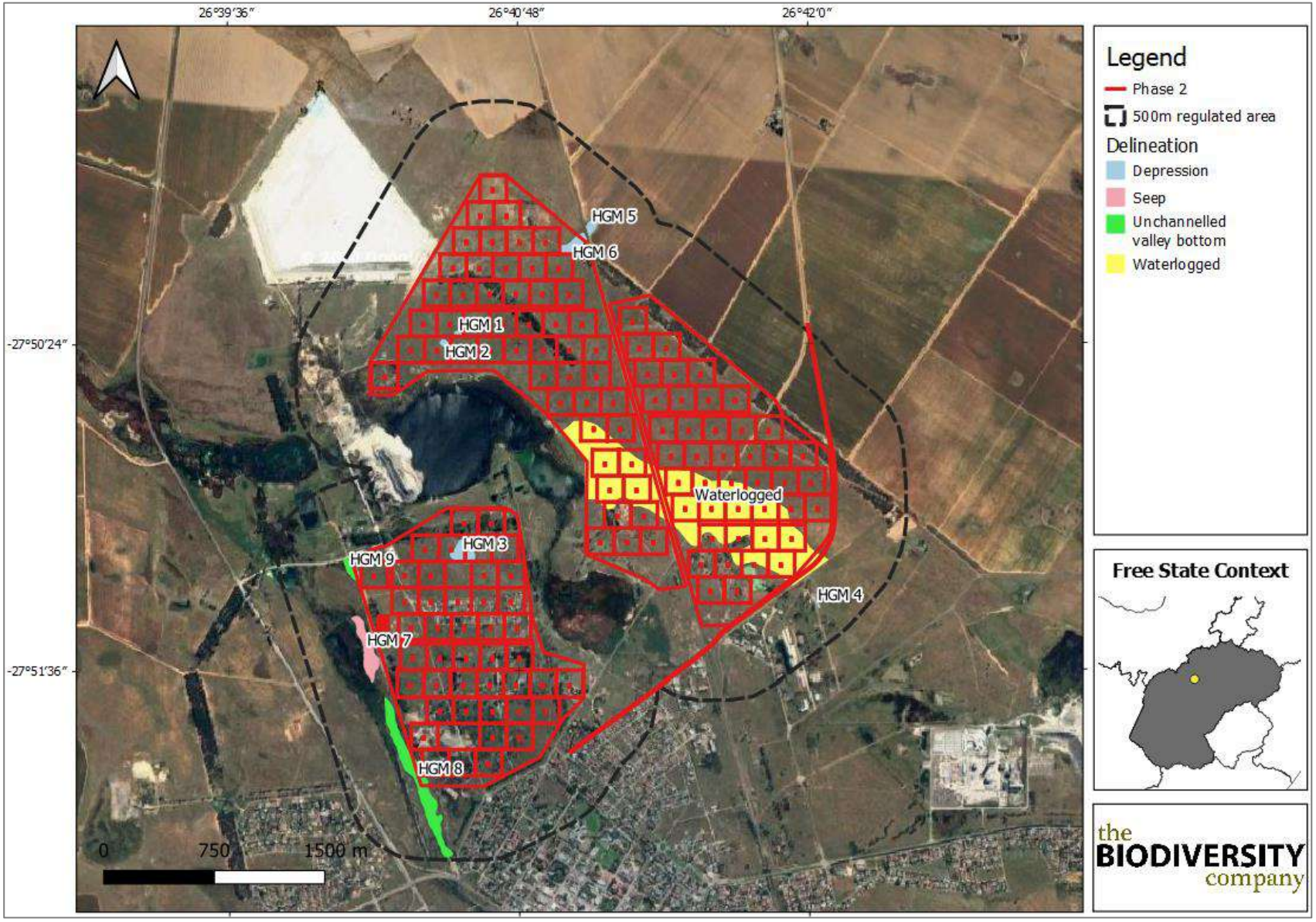


Figure 73: **Wetland delineation for Phase 2 Site (TBC, 2020a)**

12.3.4.2 Ecological Importance and Sensitivity

Several factors were considered when establishing the EIS of the various wetlands. Regional to national scale considerations included NFEPA river or wetland status, protected areas as well as Ramsar wetlands. Local considerations included habitat integrity and diversity, likelihood of supporting conservation important species and potential for hosting significant congregations of local or migratory species.

The EIS of all HGM units associated with the Phase 1 and Phase 2 Sites were determined to be in a moderate (class C) to low / marginal (class D) classification. Most systems and overall wetland areas associated for both phases were rated a class D EIS.

12.3.4.3 Buffer Assessment

Buffer zones have been used in land-use planning to protect natural resources and limit the impact of one land-use on another. A buffer zone has been prescribed for this Project to serve as a “barrier” between the proposed development and the wetland systems. This buffer area would only be applicable to wetland areas that will not be lost as a result of the Project.

The wetland buffer zone tool was used to calculate the appropriate buffer required for the proposes solar development. The model shows that the largest risk posed by the Project during the construction phase is that of “increased sediment inputs and turbidity”. During the operational phase, the flow patterns being altered (increase flood peaks), increased sediment inputs and altered water quality are high risks. These risks are based on what could threaten the wetland and what buffer would be required at a desktop level. A buffer zone of 22m was suggested, which was calculated assuming no mitigation measures are applied. However, given the expected loss of wetland area, it is recommended that a conservative approach be opted for the remaining wetland systems and a minimum buffer width of 30 m be implemented.

12.3.4.4 Sensitivity Assessment

A sensitivity map was produced to visually represent the sensitivity of each HGM unit to the proposed development based on the findings of the assessment (see **Figure 74** and **Figure 75** below). All identified wetland HGM units were classified as having a High sensitivity while their associated 30 m buffers were assigned a Medium sensitivity. The remaining extent of the Project areas (for both phases) were assigned a Low sensitivity from a water resource perspective. It is important to note that this map does not replace any local, provincial or government legislation relating to these areas or the land use capabilities or sensitivities of these environments.

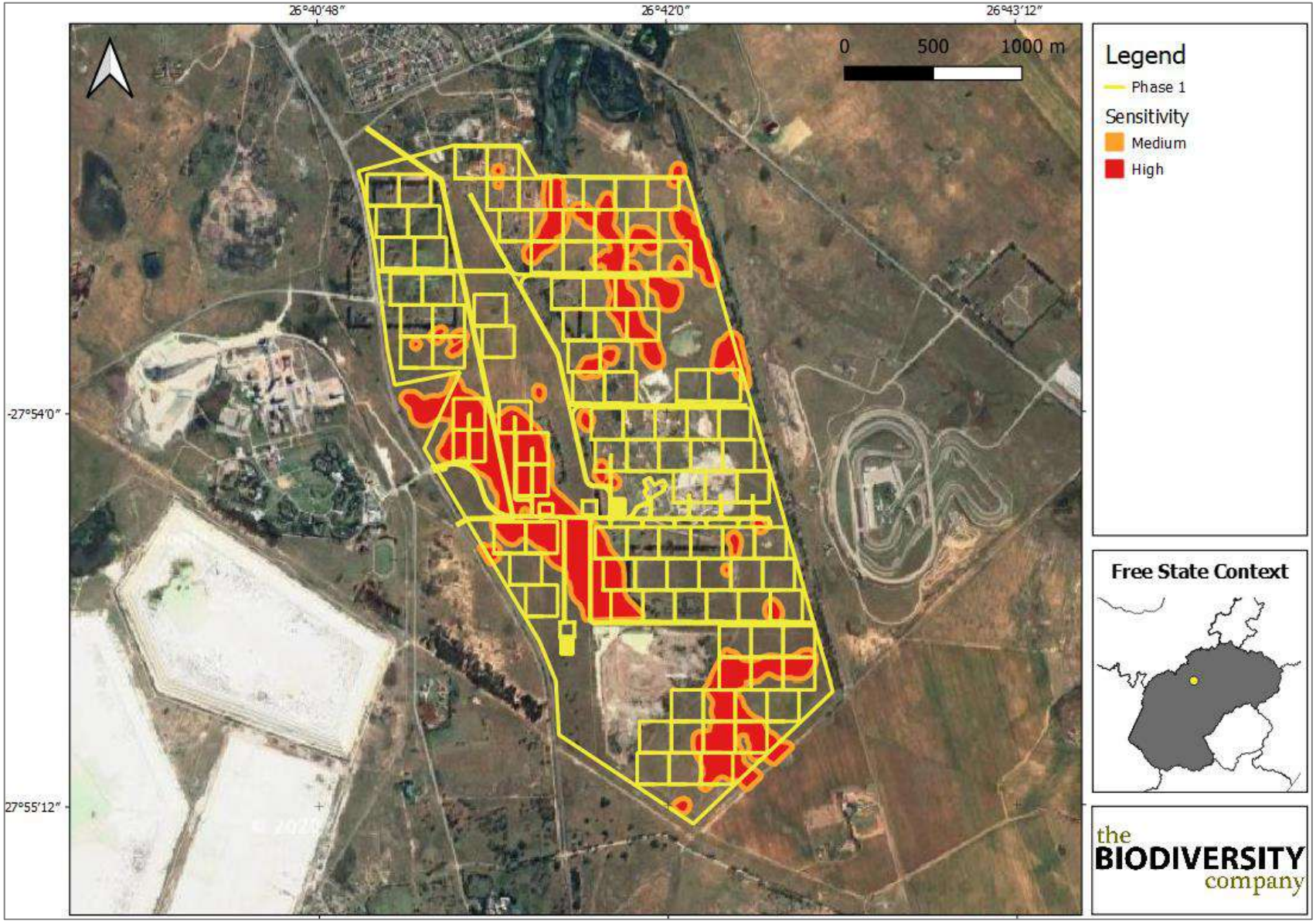


Figure 74: **Wetland sensitivity for Phase 1 Site (TBC, 2020a)**

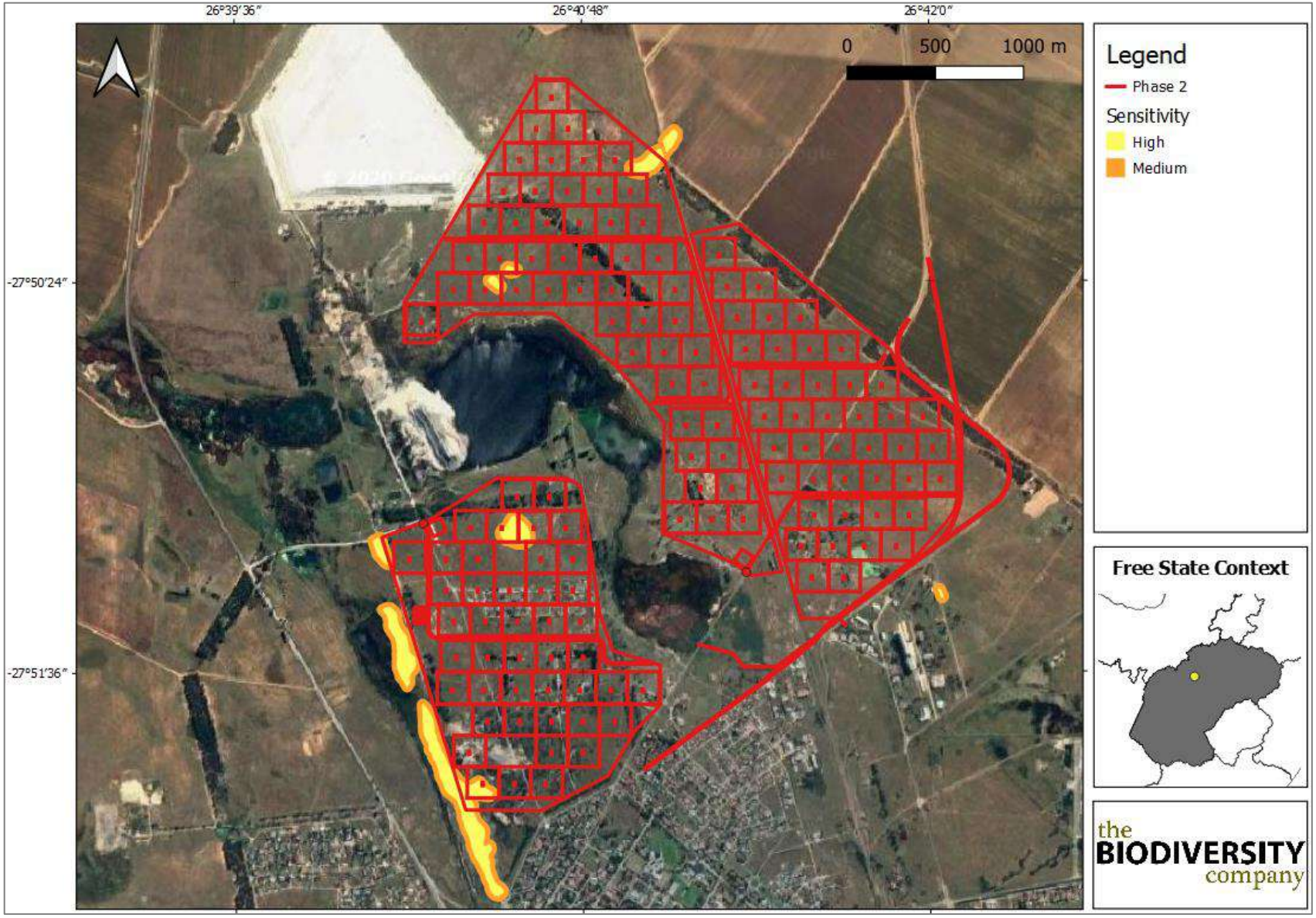


Figure 75: Wetland sensitivity for Phase 2 Site (TBC, 2020a)

12.3.5 Impact Assessment

Refer to **Section 13.12** for the results from the impact assessment from this study.

12.3.6 Conclusions

A total of 29 and 9 individual natural wetland HGM units were identified and delineated within the project areas for Phase 1 and Phase 2, respectively. One non-HGM type is associated with Phase 1, namely a dam. A waterlogged area was also delineated for Phase 2. This area has not been characterised as a natural wetland and is regarded as artificial.

The overall wetland health for Phase 1 determined that most of the systems within the project area are classified as class C (Moderately Modified) followed by class E (Seriously Modified), and class D (Largely Modified) systems. Most wetland area is covered by class D systems followed by class C, then class E systems. The overall wetland health for Phase 2 determined that most of the wetland systems are classified as Largely Modified, which is consistent with the most wetland area considered class D. The wetland areas for both phases are predominantly in a Largely Modified status.

The EIS of all HGM units associated with Phase 1 and Phase 2 were determined to be in a moderate (class C) to low / marginal (class D) classification. Most systems and overall wetland areas associated for both phases were rated a class D EIS.

A 30m buffer area was determined to be suitable for the project components, this would only be applicable to the wetland areas that will not be lost as a result of the project.

Overall, all anticipated risks are considered to have a Moderate impact significance due to the expected loss of wetland areas. It has been recommended that the expected loss of wetland areas must be compensated for. A compensation strategy should be informed by the issuing authority.

12.4 Terrestrial Ecology Assessment

A summary of the Terrestrial Ecology Assessment (TBC, 2020b) (contained in **Appendix H2**) follows.

12.4.1 Details of the Specialist

The details of the specialists that undertook the Terrestrial Ecology Assessment follow.

Organisation:	The Biodiversity Company
Name, Qualifications:	▪ L. Steyn - PhD Biodiversity and Conservation ▪ M. Erasmus - B-Tech Degree in Nature Conservation ▪ A. Husted - MSc Aquatic Health
Affiliation (if applicable):	South African Council for Natural Scientific Professions (SACNASP) Professional Natural Scientist (Registration No.: 400213/11)

12.4.2 Objectives of the Study

The objectives of this study included the following:

- Describe the baseline receiving environment specific to the field of expertise (general surrounding area as well as site specific environment);
- Identify and describe any sensitive receptors in terms of fauna & flora that occur in the Project area, and the manner in which these sensitive receptors may be affected by the activity;
- Identify 'significant' ecological, botanical and faunal features within the proposed Project areas;
- Identify conservation significant habitats around the Project area which might be impacted;
- Identify any critical issues (potential fatal flaws) that may result in Project delays or rejection of the application;
- Compile a map showing sensitive receptors in the Project area;
- Conduct risk assessments relevant to the proposed activity; and
- Suggest mitigation measures to address possible impacts.

12.4.3 Methodology

The assessment included the following tasks (amongst others):

- Existing data layers were incorporated into GIS software to establish how the proposed Project might interact with any ecologically important features;
- A botanical assessment was undertaken, which encompassed an assessment of all the vegetation units and habitat types within the Project area. This focused on an ecological assessment of habitat types as well as identification of any Red Data species within known distribution of the Project area;
- A faunal assessment was undertaken, which included the following:
  - The faunal desktop assessment encompassed:
    - Compilation of expected species lists;
    - Identification of any Red Data or SCC potentially occurring in the area; and
    - Emphasis was placed on the probability of occurrence of species of provincial, national and international conservation importance.
  - The field survey component of the assessment utilised a variety of sampling techniques including, but not limited to, the following -

  - Visual observations;
  - Identification of tracks and signs; and
  - Utilization of local knowledge.
- Site selection for trapping focussed on the representative habitats within the Project area.

The survey was conducted in November 2020, during the wet season.

12.4.4 Key Findings of the Study

A description of the terrestrial ecological features in the Project area is contained in **Section 11.7** above.

Key findings from the study follow.

12.4.4.1 Vegetation Assessment

Protected Plant Species

Several individuals of four protected plant species that are protected by the Free State Nature Conservation Ordinance 8 of 1969 were observed in various parts of the Project area, especially the degraded grassland of Phase 1. According to the list of protected species under Schedule, if any individuals of these plant species are to be disturbed, permits must be obtained from DESTEA.

According to the National Forests Act (NFA) (Act No.84 of 1998), no person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell, donate, or in any other manner acquire or dispose of any protected tree or any product derived from a protected tree, except under a license or exemption granted by the Minister to an applicant and subject to such period and conditions as may be stipulated. Contravention of this declaration is regarded as a first category offence. A single Camel thorn (*Vachellia erioloba*) was observed in the Project area (location: 27°53'52.73"S and 26°42'5.24"E) and this tree must not be harmed in the construction phase unless a permit to do so has been obtained.

Alien and Invasive Plants

Seventeen (17) alien and/or invasive plants were recorded during the field survey within the Project area.

12.4.4.2 Habitat Assessment

The delineated habitat types identified in the Project area are shown in **Figure 76** to **Figure 79** below. A description of each habitat type follows below.

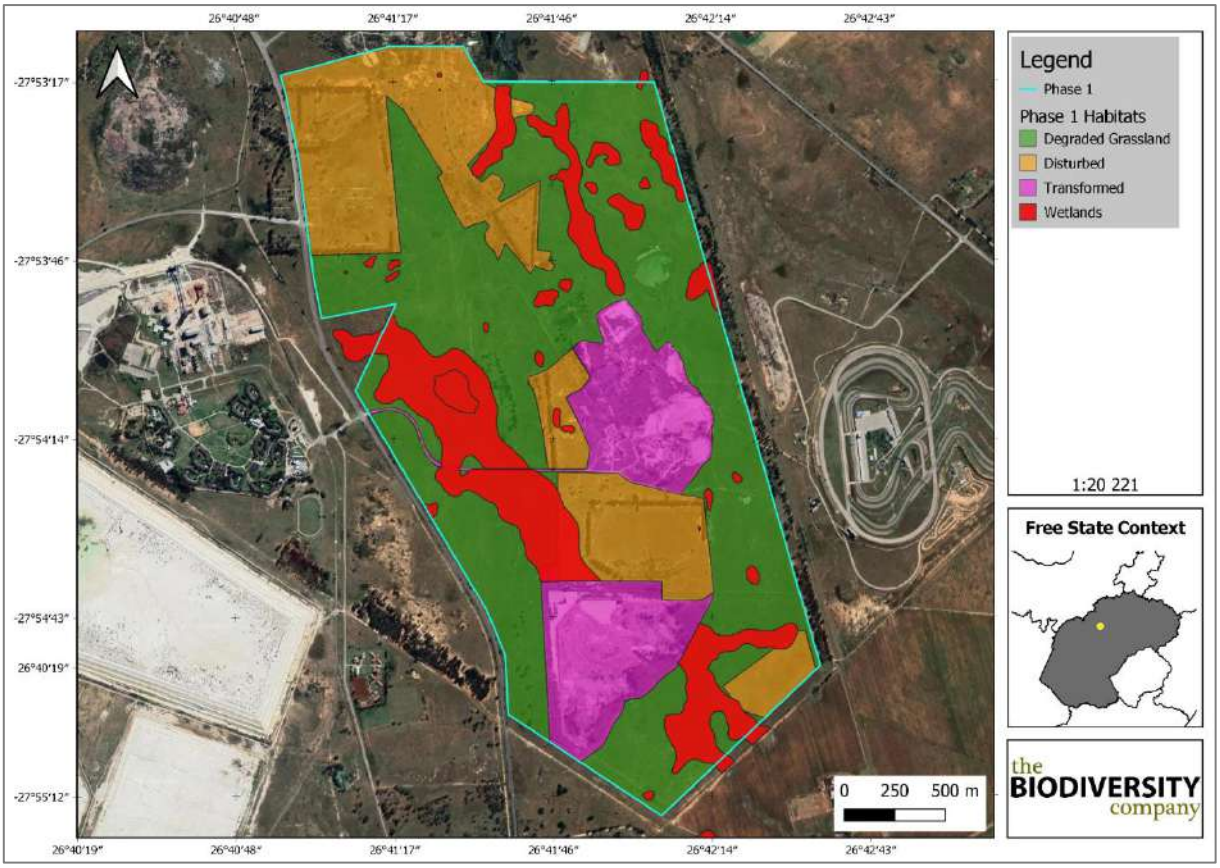


Figure 76: Habitats identified and delineated within the Phase 1 Site (TBC, 2020b)

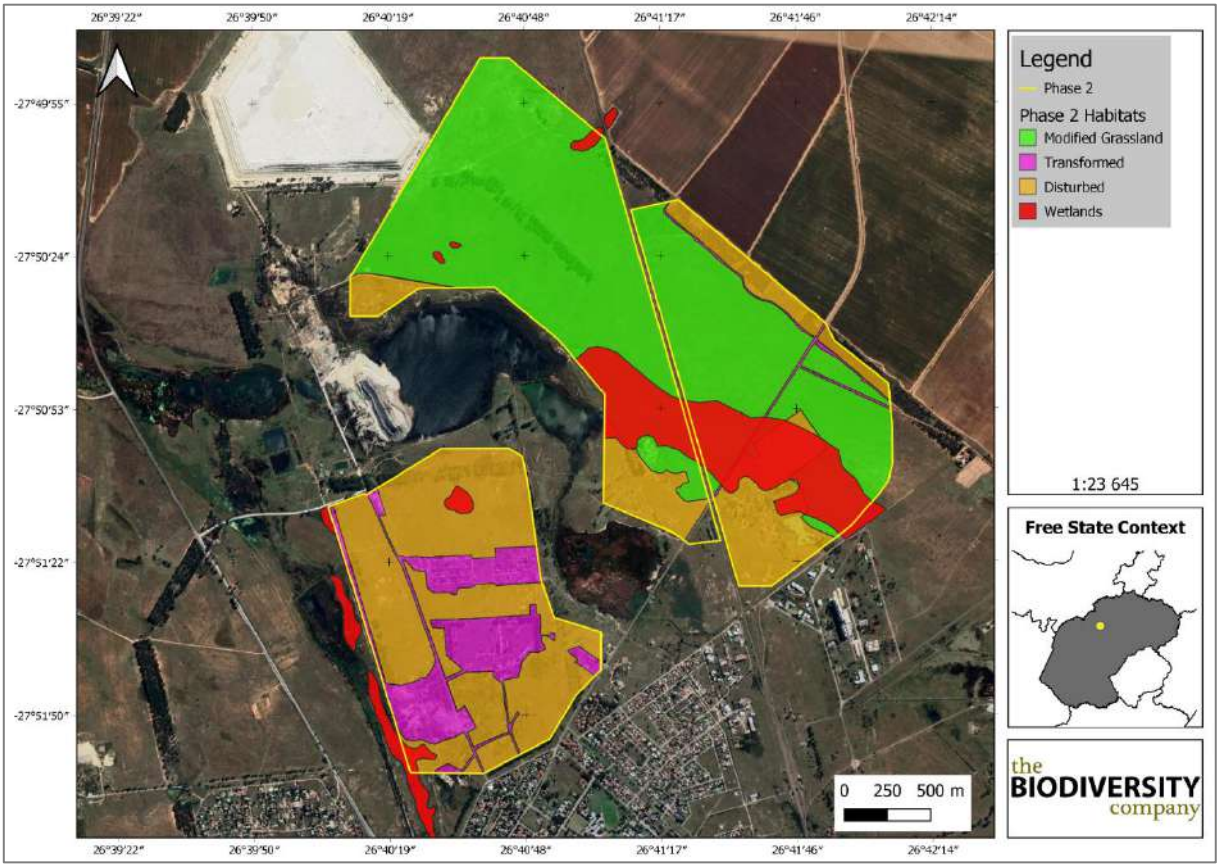


Figure 77: Habitats identified and delineated within the Phase 2 Site (TBC, 2020b)

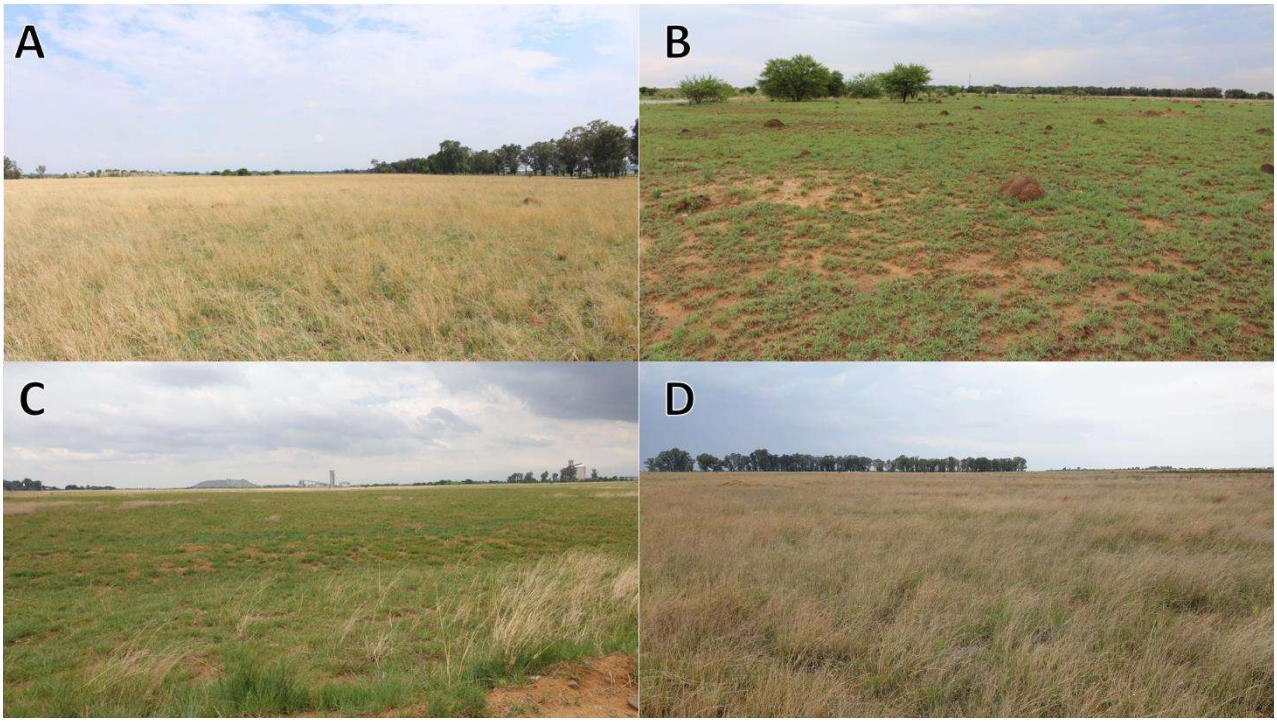


Figure 78: **Photographs of the habitats identified in the Project Area: A & B) Degraded Grassland, C & D) Modified Grassland (TBC, 2020b)**

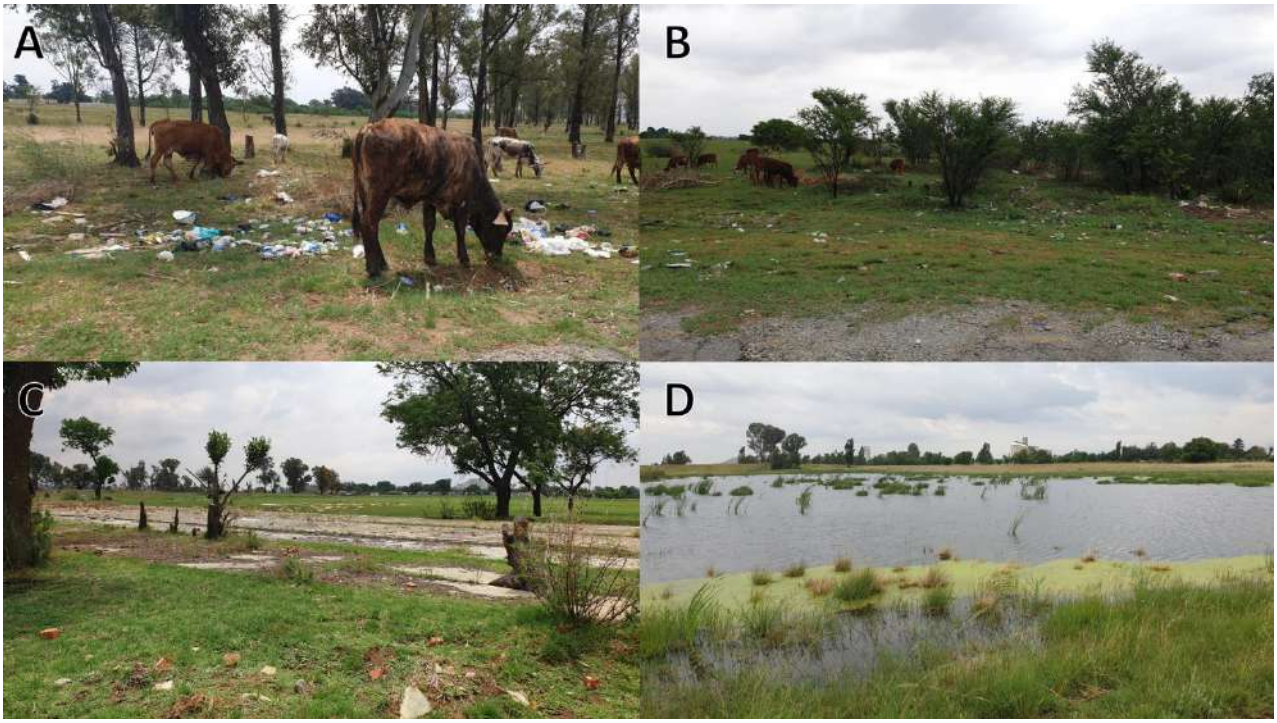


Figure 79: **Photographs of the habitats identified in the Project area: A& B) Disturbed, C) Transformed and D) Wetlands (TBC, 2020b)**

Degraded Grassland

The condition of these grassland has been degraded, mainly due to overgrazing by livestock (cattle and goats). The current ecological condition of this habitat in regard to the main driving forces, are intact; which is evident in the amount of, and importance of the

species recorded in the faunal assessment, and also to the high species diversity and number of plant species recorded. This habitat are areas where the grassland has been altered due to historic and/or current human activity and the associated incidental impacts. The sensitivity of these areas is regarded as moderate due to the fact that these areas are connected to more sensitive habitats, thus not only forms a buffer but also part of the movement corridor.

This habitat also has a higher potential to returning to a more natural state if left undisturbed. The degraded Grassland was rated with a moderate sensitivity because it:

- It may serve as and represent CBA and ESA if enabled to recover, as per the Conservation Plan;
- The one protected tree and a large number of the protected plant species occurred within this habitat; and
- May support various species and may play an important role in the ecosystem if left to recover from the superficial impacts.

Modified Grassland

This habitat are areas where the grassland has been altered due to historic agriculture where these areas were used for agricultural lands. This habitat is regarded as modified due to the nature of the modification of the area, however, has been able to recover somewhat to a point where it can support biodiversity. Due to the nature of this habitat, it is regarded as having a moderate sensitivity.

Disturbed

This habitat is regarded as areas that has been impacted by edge effects of transformed areas as well as direct impacts from livestock, dumping and infringement. These habitats are not entirely transformed but in a constant disturbed state as it cannot recover to a more natural state due to ongoing disturbances and impacts it receives from the transformed areas. These areas are considered to have a low-moderate sensitivity due to the fact that these areas may be used as a movement corridor and in many cases form a barrier between the more natural grassland and the disturbed/transformed areas.

Transformed

This habitat unit represents all areas of urban area, mining areas, agriculture and infrastructure such as roads .This habitat is regarded as transformed due to the nature of the modification of the area to such a point where it wouldn't be able to return to its previous state. Due to the transformed nature of this habitat, it is regarded as having a low sensitivity.

Wetlands (including waterlogged area)

This habitat unit represents the watercourse and wetland areas (including waterlogged area at the Phase 2 Site) with the grasslands that it is connected to. The wetlands habitats are according to the Water Resource Assessment Report (TBC, 2020a). This habitat type is regarded as intact and therefore natural, but slightly disturbed due to grazing by livestock and the surrounding land uses like mining and agriculture. Despite this and due to its limited distribution in the landscape, this habitat is regarded as having a high sensitivity.

12.4.4.3 Sensitivity Analysis

The sensitivity maps for the Phase 1 and Phase 2 Sites are shown in **Figure 80** and **Figure 81** below, respectively.

In terms of terrestrial habitats, areas that were classified as having a low-moderate sensitivity are those areas which were deemed by the specialists to have been impacted upon and/or were disturbed from their original condition due to historic and recent impacts associated the anthropogenic presence throughout. Areas with a high sensitivity are the wetland habitats identified.

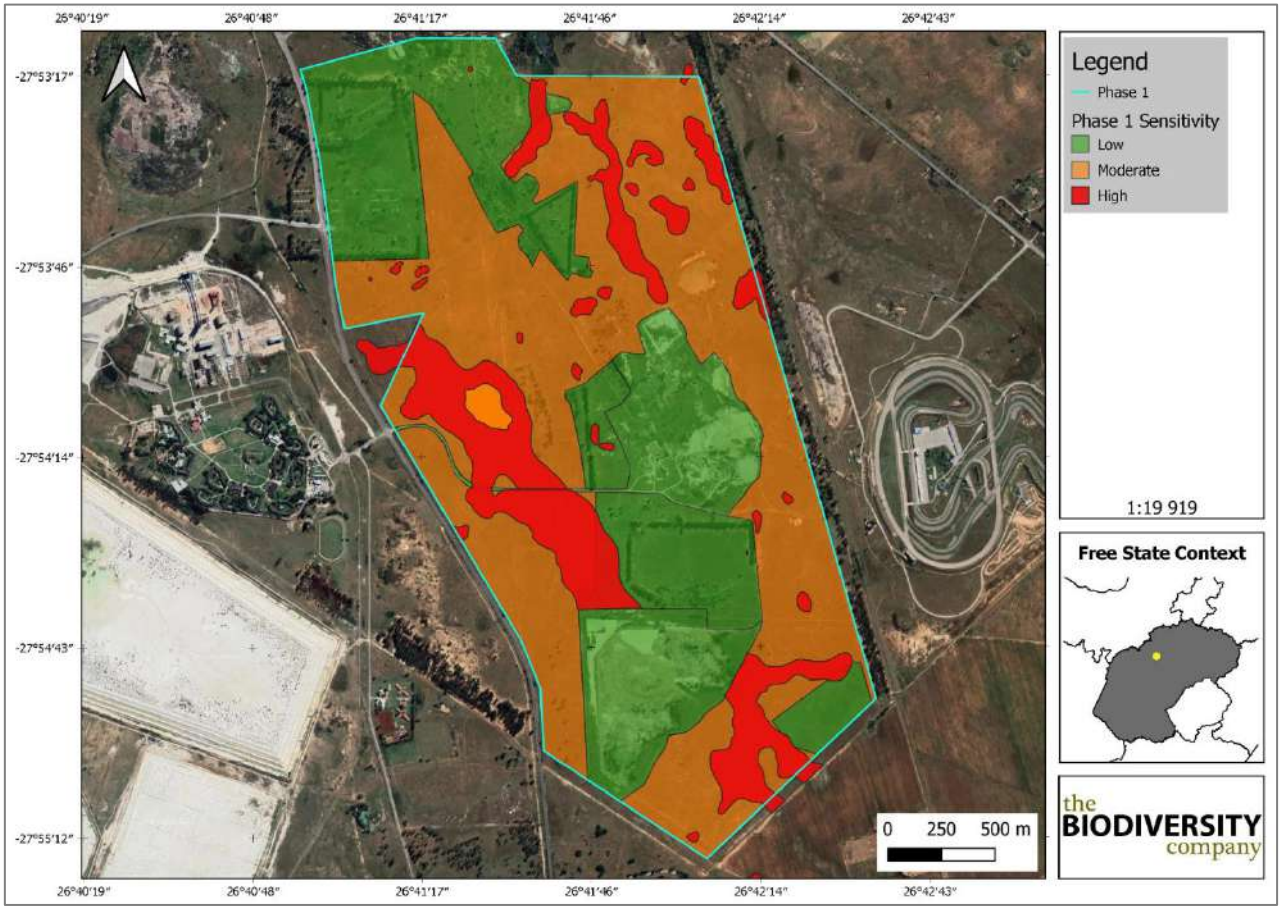


Figure 80: Terrestrial biodiversity sensitivity of the Phase 1 Site (TBC, 2020b)

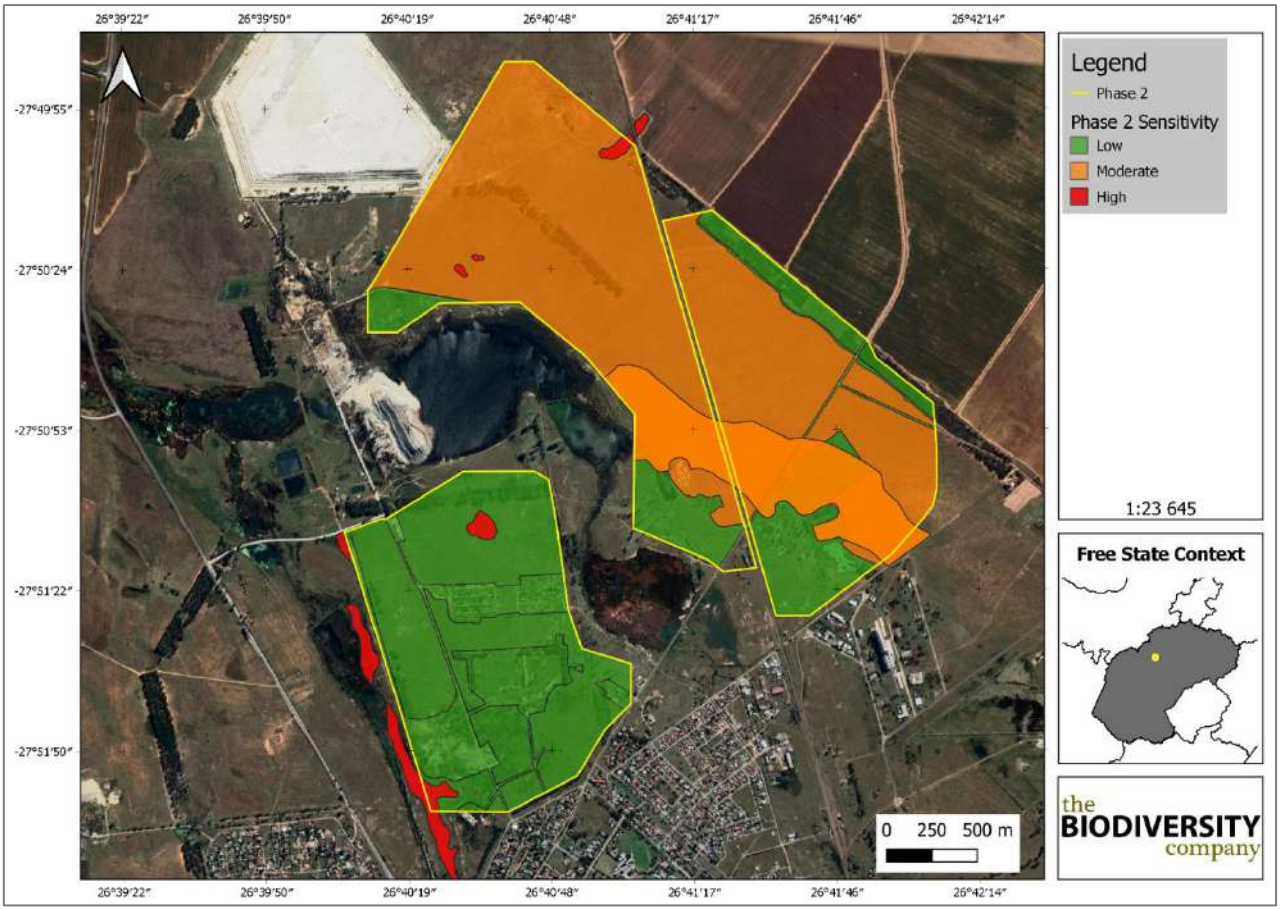


Figure 81: Terrestrial biodiversity sensitivity of the Phase 2 Site (TBC, 2020b)

12.4.5 Impact Assessment

Refer to **Section 13.13** for the results from the impact assessment from this study.

12.4.6 Conclusions

The Project area has been altered both currently and historically. However, the degraded Grassland can be regarded as important, not only within the local landscape, but also regionally; as they are used for habitat, foraging and movement corridors for fauna within a fragmented landscape to more natural areas where they may reproduce. The degraded Grassland was rated with a moderate sensitivity.

The ecological integrity, importance and functioning of these terrestrial biodiversity areas provide a variety of ecological services considered beneficial, with one key service being the maintenance of biodiversity. The preservation of these systems is the most important aspect to consider. The wetland habitats are important due to their inherent environmental function and the Water Resource Assessment Report needs to be consulted in relation to that component.

Considering the above-mentioned information, no fatal flaws are evident for the proposed Project. It is the opinions of the specialists that the project, may be favourably considered, should on condition all prescribed mitigation measures and supporting recommendations are implemented.

12.5 Avifaunal Assessment

A summary of the Avifaunal Assessment (TBC, 2020c) (contained in **Appendix H3**) follows.

12.5.1 Details of the Specialist

The details of the specialist that undertook the Avifaunal Assessment follow.

Organisation:	The Biodiversity Company
Name:	T. Clark
Qualifications:	MSC Zoological Science
Affiliation (if applicable):	SACNASP Professional Natural Scientist (Registration No.: 121338)

12.5.2 Objectives of the Study

The objectives of this study included the following:

- Undertake baseline survey and describe affected environment within the Project's footprint from an avifauna biodiversity perspective;
- Identify avifaunal SCC. Prepare an avifaunal sensitivity map with the use of GIS, based on the findings of the study; and
- Assess impacts to avifauna associated with the Project and recommend suitable mitigation measures.

12.5.3 Methodology

The assessment included the following tasks (amongst others):

- Incorporate existing data layers into GIS software to establish how the proposed Project might interact with any ecologically important entities as relevant to avifauna;
- Identify expected species likely to occur in the area, making use of the relevant datasets;
- Undertaken sampling, consisting of standardized point counts as well as random incidental surveys; and
- Analise sampling data.

12.5.4 Key Findings of the Study

A description of the avifauna in the Project area is contained in **Section 11.8.4.1** above. Key findings from the study follow.

12.5.4.1 Review of Renewable Energy Projects in proximity to the Site

According to the REEA Database (http://egis.environment.gov.za/), there are five (5) renewable energy applications in close vicinity to the Project area (see **Figure 82** below). This increases the overall impact on the avifauna in the area.

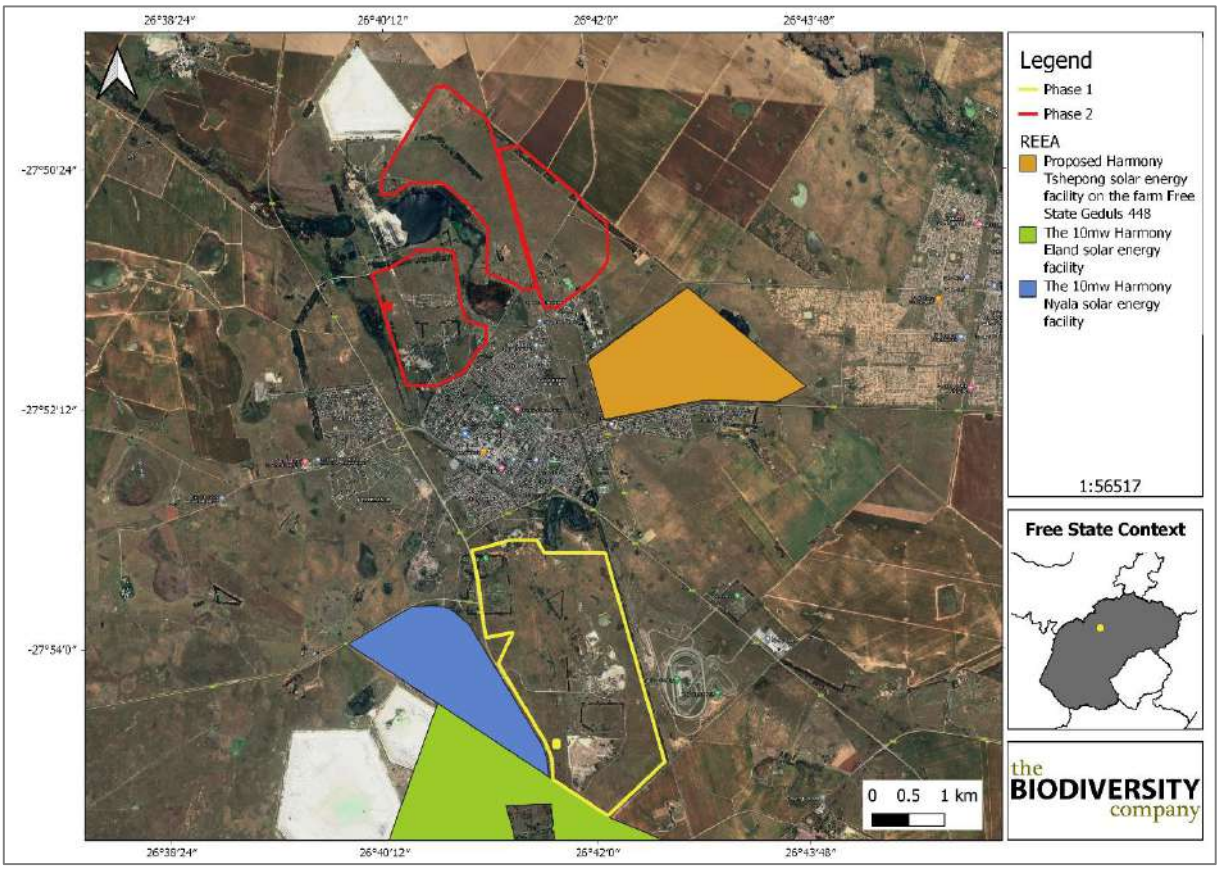


Figure 82: The Project Area in relation to nearby renewable energy projects (TBC, 2020c)

12.5.4.2 Site Diversity

The PV sites are situated in a region with flat topography and low water table, dominated by pans and wetlands. Some of these areas have been artificially inundated due to discharge of both municipal drinking (leaks and overflowing mains) and mine water (decant from shafts). This has resulted a landscape characterised by a mosaic of wetlands (in lower lying areas) between the mines, towns, croplands and remaining grassland. The nutrient rich waters have led to the proliferation of dense reedbeds and extensive sedge fields in this area which in turn attract large congregations of waterbirds.

Survey work in this area for the current project (over dry and wet seasons for north Phase 1 and 2 PV sites) yielded a total of 107 bird species.

Results from the current study indicate that species richness, abundance and overall diversity was considerably higher within the Phase 2 Site as compared to the Phase 1 Site. This is attributable to the higher habitat diversity and structural complexity afforded by the

large waterbodies within the Phase 2. The type of large permanent wetlands characteristic of the area are lacking from the Phase 1 Site and as such this area supports a much lower abundance and diversity of species.

As with the surveys conducted at the Project areas species richness differed markedly between dry (69 spp.) and wet (90 spp.) season surveys. The majority of these species are accounted for by the influx in migrants.

Table 22 below provides a list of the top ten most abundant species (together with the frequency with which each species appeared in the point count samples) for each PV site. Together these species account for 87% and 70% of the total number of observed individuals at the Phase 1 and Phase 2 Sites, respectively. This data reveals that common, adaptable and commensal species (e.g. White-browed Sparrow-Weaver and Laughing Dove) characterise the exclusively terrestrial (and degraded) habitat at the Phase 1 Site while waterbirds (e.g. Greater Flamingo and Red-billed Teal) are by far the most abundant birds at the Phase 2 Sites.

Table 22: Top ten most abundant species found in the Project Areas (TBC, 2020c)

Common Name	Scientific Name	Relative Abundance	Frequency (%)
Phase 1			
Abdim's Stork	*Ciconia abdimii*	0.13	0.51
Acacia Pied Barbet	*Tricholaema leucomelas*	0.13	0.51
African Red-eyed Bulbul	*Pycnonotus nigricans*	0.13	0.51
African Sacred Ibis	*Threskiornis aethiopicus*	0.13	0.51
Ant-eating Chat	*Myrmecocichla formicivora*	0.27	0.51
Banded Martin	*Riparia cincta*	0.67	0.51
Barn Swallow	*Hirundo rustica*	1.74	0.51
Black-headed Heron	*Ardea melanocephala*	0.13	0.51
Cape White-eye	*Zosterops virens*	0.27	0.51
Chinspot Batis	*Batis molitor*	0.13	0.51
Phase 2			
African Palm Swift	*Cypsiurus parvus*	0.13	0.28
African Spoonbill	*Platalea alba*	0.13	0.28
Banded Martin	*Riparia cincta*	0.07	0.28
Cape Shoveler	*Spatula smithii*	0.07	0.28
Cape Sparrow	*Passer melanurus*	0.26	0.28
Cape White-eye	*Zosterops virens*	0.26	0.28
Capped Wheatear	*Oenanthe pileata*	0.07	0.28
Common Sandpiper	*Actitis hypoleucos*	0.26	0.28
Gabar Goshawk	*Micronisus gabar*	0.07	0.28
Greater Striped Swallow	*Cecropis cucullata*	0.13	0.28

12.5.4.3 Sampling Adequacy

During the survey a total of 745 (n=48) and 1535 (n=53) birds were counted from Phase 1 and Phase 2 Sites, respectively. Sampling effort is deemed adequate and the inventory considered largely representative of the bird community that inhabits the respective PV areas.

12.5.4.4 Habitat Diversity

Overall, most of the Phase 1 and Phase 2 Sites have been disturbed (to varying degrees) by past and current anthropogenic land use practices relating to crop cultivation, urban sprawl, water discharge, mining, infrastructure and livestock grazing. Three broad avifaunal habitat types were identified within the Phase 1 and Phase 2 Sites, namely Wetlands (pans, valley-bottom wetlands and artificial wetlands), Grasslands and Transformed (grassland habitat degraded or destroyed through past crop cultivation, alien plant encroachment or other anthropogenic land use practices). The least impacted and most functional grasslands occur in the western and southern portions of the Phase 1 Site and the northern block of the Phase 2 Site. Although the Phase 1 Site is, overall, less impacted than the Phase 2 Site, the large waterbodies within the Phase 2 Site provide greater habitat diversity, foraging and breeding habitat for avifauna.

At the Phase 1 Site, diversity was highest in the Grassland habitat as compared and lowest in the Wetland habitat. The lower than expected diversity within the Wetland habitat (lower than Transformed) is attributable to the shallow, temporary to seasonally inundated nature of these wetlands which lack significant reedbeds and are mostly open and grassy with a low microhabitat diversity.

At the Phase 2 Site, diversity was highest in the Wetlands habitat followed by Grassland and then Transformed habitats. The Wetland habitats in this PV area support an exceptional species richness and abundance of waterfowl. Some of the larger waterbodies in this area form part of a greater wetland mosaic that support large congregations of waterbirds at densities that should be considered important on a national scale. Large, yet shallow, permanently inundated watercourses with an abundance of emergent hydrophytes and marsh habitat were found to support the highest diversity of waterfowl. The southern watercourse is one such example (27°51'25.59"S; 26°41'16.65"E). The large northern dam supported a comparatively low abundance and diversity of waterfowl. A small waterbody to the east was found to represent an important roost site for a large number of Red-billed Teal and White-faced Whistling Duck (27°51'14.16"S; 26°41'46.87"E).

12.5.4.5 Habitat Uniqueness

At the Phase 1 Site, little to no distinction can be made between the bird assemblages that occupy each of the three main habitats. This reveals that the bird community is comprised

of mostly of common and adaptable generalist species that move freely between the different habitats. Waterfowl are too poorly represented on site to distinguish this habitat.

In contrast, the Wetland habitat at the Phase 2 Site stands out as having a bird assemblage that is largely distinct. Although, the Grassland and Transformed habitats contain a similar compliment of species, it is evident that the transformed habitat supports a much smaller compliment of species and that successive samples in this habitat yielded very similar species each time.

12.5.4.6 Species of Conservation Concern

The region is known to support at least 15 IUCN Red-listed species). The PV sites are significant from an avifaunal perspective as they provide suitable habitat to support at least visitation by all of these species. Of particular significance, is the Phase 2 Site due to the extent and suitability of the type of wetland habitat frequented by most of these species. Many of these species, are however, rare species which are range over extremely large areas and consequently are only likely to make brief sporadic visits to the Project area.

Resident species for which suitable breeding habitat exists within the Project area are limited to African Marsh Harrier and Maccoa Duck. During the site visit three SCC were observed within the Project area, namely Abdim's Stork from the south-western grasslands of the Phase 1 Site as well as Greater and Lesser Flamingo from the watercourses at the Phase 2 Site.

Figure 83: **SCC bird species observed on site; A) African Marsh harrier, B) Lesser Flamingo, C) Abdim's Stork (TBC, 2020c)**

Table 23: List of present and potentially occurring red-listed avifauna (TBC, 2020c)

Common Name	Scientific Name	Phase		SABAP 2	Status (Regional, Global)
		P 1	P 2		
African Marsh Harrier	*Circus ranivorus*	3	2	x	EN, LC
Yellow-billed Stork	*Mycteria ibis*	2	2	x	EN, LC
Secretarybird	*Sagittarius serpentarius*	2	2	x	VU, VU
Lanner Falcon	*Falco biarmicus*	2	2	x	VU, LC
Black Stork	*Ciconia nigra*	2	2	x	VU, LC
Maccoa Duck	*Oxyura maccoa*	3	2	x	VU, LC
Caspian Tern	*Sterna caspia*	2	2		NT, VU
Chestnut-banded Plover	*Charadrius pallidus*	2	2	x	NT, NT
Black-winged Pratincole	*Glareola nordmanni*	2	2	x	NT, NT
Lesser Flamingo	***Phoeniconaias minor***	**2**	**1**	**x**	**NT, NT**
Blue Korhaan	*Eupodotis caerulescens*	3	3	x	LC, NT
Curlew Sandpiper	*Calidris ferruginea*	2	2	x	LC, NT
Greater Flamingo	***Phoenicopterus roseus***	**2**	**1**	**x**	**NT, LC**
Abdim's Stork	***Ciconia abdimii***	**1**	**2**		**NT, LC**

12.5.4.7 Collision Prone Species

Species considered particularly prone to collision based on count data, body size and flight patterns include (in order of risk) Greater Flamingo, Lesser Flamingo, Glossy Ibis, African Sacred Ibis, Spur-winged Goose, Egyptian Goose, Red-billed Teal, Cape Shoveler, Western Cattle Egret, Black-headed Heron Northern Black Korhaan and Helmeted Guineafowl.

12.5.4.8 Potential Collision Hotspots

Figure 84 and **Figure 85** below provide an indication of potential hotspots for collision and electrocution based on the data collected during the wet-season survey on the abundances of collision prone species.

The modelling exercise revealed several collision hotspots which support the highest congregations of collision and electrocution prone species. The most significant of which occurs within portions of the Phase 2 Site. More, specifically a wetland area in the southern third of the eastern Phase 2 Transformer Block.

During the surveys data collected on numbers of commuting individuals of each species and flight direction revealed broad patterns in habitual commuting routes, referred to hereafter as prevailing flight paths. At the Phase 1 Site, two prevailing flight paths were identified. The main flight path in this area has a NNW-SSE trend across the eastern portion of the PV site. This flight path links the network of pan habitats to the south of Welkom with the large waterbody on the northern end of the Phase 2 Site and thereafter the wetland systems at the Phase 1 Site. The other flight path identified in this area is NE-SW trending route which cuts across the north-eastern corner of the Phase 1 PV area.

This flight path links to the large panveld habitat situated to the west of Odendaalsrus. Although these prevailing flight paths were discernible in-field they did not show particularly high overall abundances, and the flocks of commuting were generally small and sporadic.

At the Phase 2 Site, one main NW-SE trending flight path was identified. This flight path was broad and showed frequent use by high abundances of commuting waterfowl including many large flocking species such as flamingos, ibises, spoonbills and ducks. This flight path links the large shallow highly frequented central wetland with a significant evening roost to the SE and other panveld habitat beyond the project area to the NE.

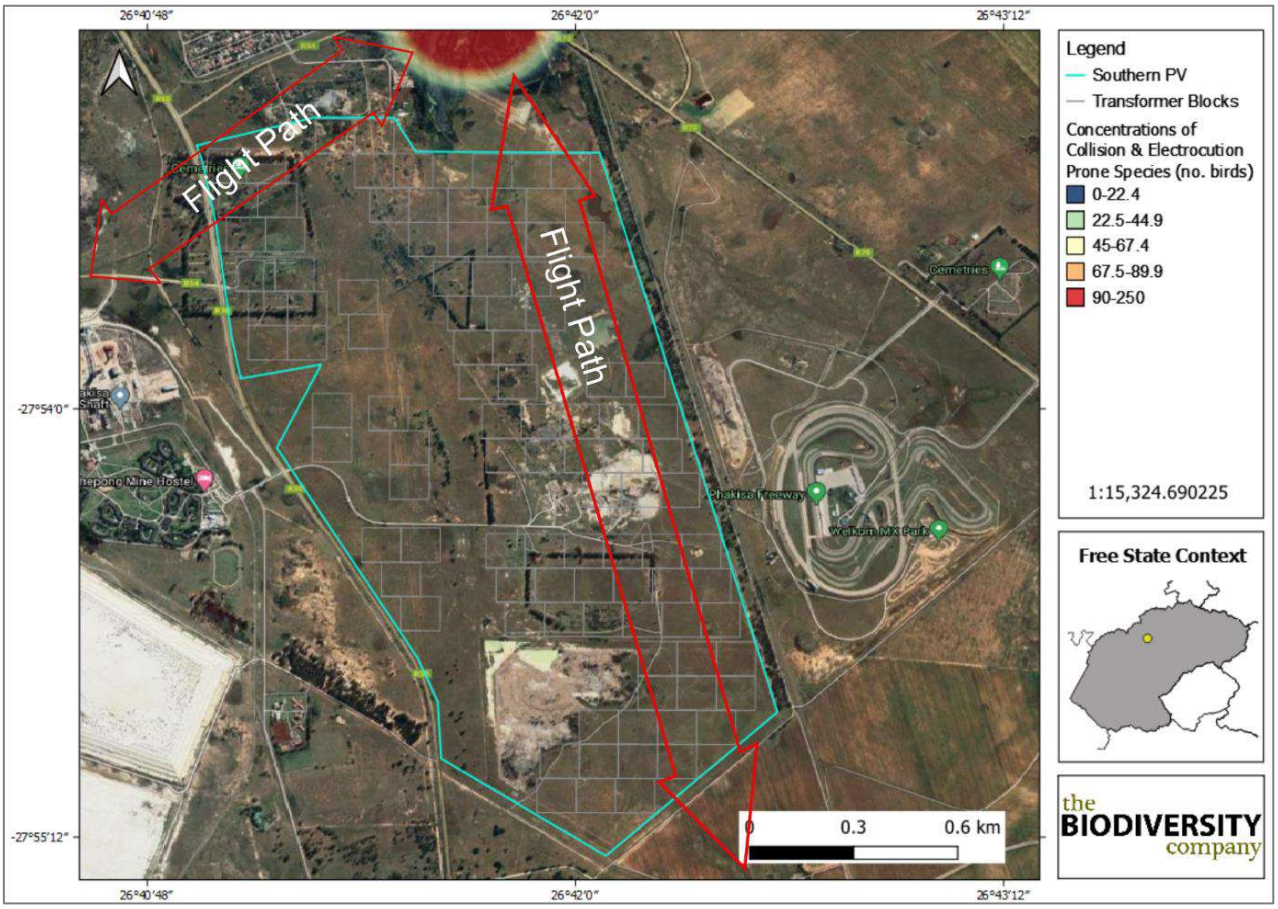


Figure 84: **Concentrations of collision and electrocution prone species at Phase 1 (TBC, 2020c)**

Figure 85: **Concentrations of collision and electrocution prone species at Phase 2 (TBC, 2020c)**

12.5.4.9 Sensitivity

Areas of avifaunal sensitivity for both Phase 1 and Phase 2 Sites are presented in **Figure 86** and **Figure 87** below, respectively. These areas were based on a combination of selected wetland delineation data, as deemed important for avifauna and abundance data on congregations of collision prone species. The wetland / watercourse areas deemed important for avifauna were assigned a very high importance and sensitivity while their buffer zones are afforded a moderate sensitivity. This is because wetland species account for the bulk of the regionally occurring SCC and are widely accepted in the literature as being most susceptible to collision with solar panels. These wetlands also supported by far the highest species richness and abundance of avifauna within the entire Project area, as well as the highest abundances of collision prone species. To account for this the heatmap model on abundances of collision prone species data was polygonised and split into three sensitivity classes namely high, moderate and moderate-low and combined with selected watercourse spatial data and buffers to arrive at the sensitivity maps provided below.

Large flocks of flamingos, ibises and other large-bodied waterfowl regularly commute to the identified sensitive watercourses within the Phase 2 Site. These wetlands together with

the main NW-SE flight path across the eastern transformer block area should be considered to be of High to Very avifaunal sensitivity.

Within the Phase 1 Site, the sensitivity assessment identifies several small scattered pans as Very High Sensitivity. However, congregations of waterfowl in these waterbodies are much less significant and the overall abundances of large-bodied waterfowl commuting across the PV area are considerably lower than at the Phase 2 Site and collision risk is deemed low here.

Figure 86: Avifaunal sensitivity for Phase 1 Site (TBC, 2020c)

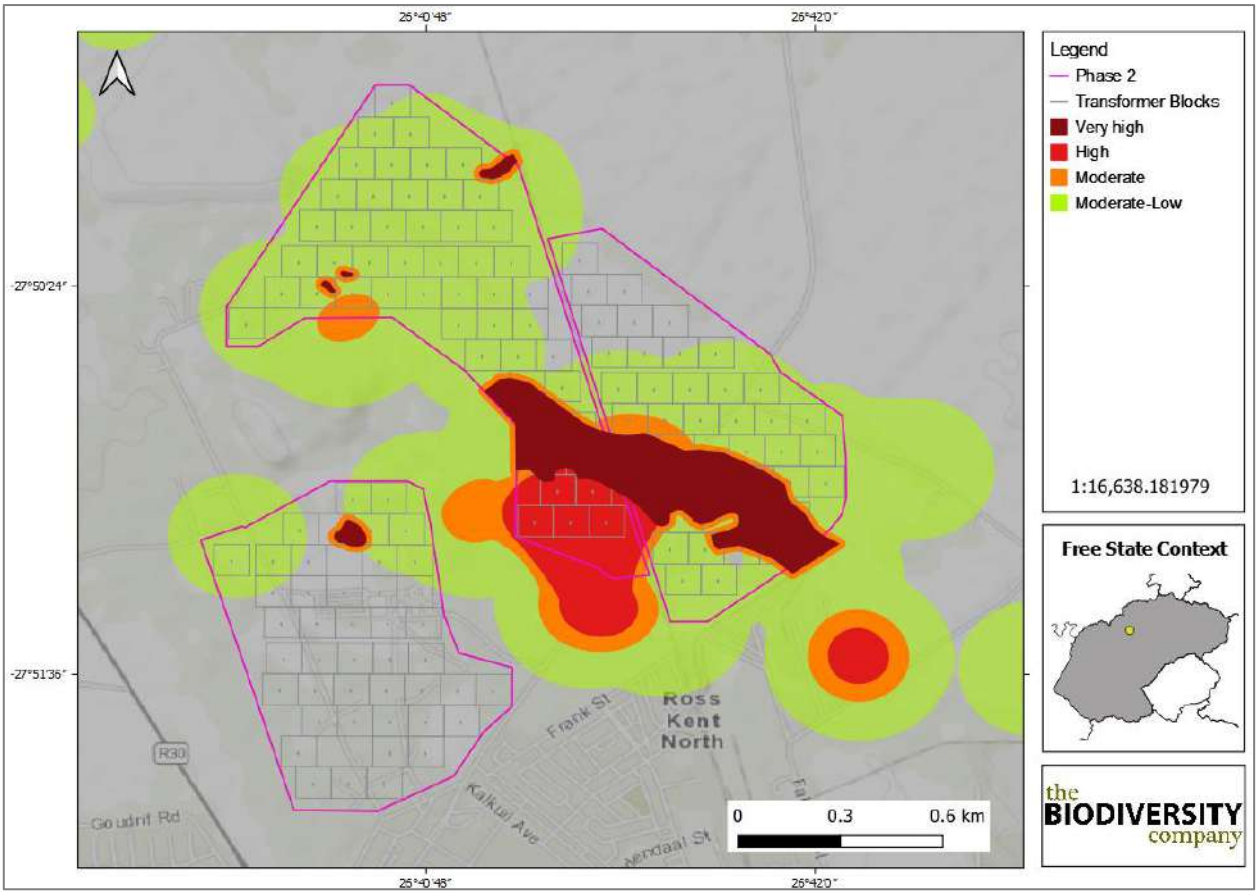


Figure 87: Avifaunal sensitivity for Phase 2 Site (TBC, 2020c)

12.5.5 Impact Assessment

Refer to **Section 13.14** for the results from the impact assessment from this study.

12.5.6 Conclusions

The assessment comprised both wet and dry season surveys. In total 2280 birds representing 109 species were counted from 115 point count samples within both PV areas. Species accumulation curves suggest adequate sampling effort and the inventory is deemed largely representative of the local avifaunal assemblages to be found within the PV areas. Species assemblages differed between wet and dry season surveys, largely on the account of the influx of non-resident species comprised of Palearctic and intra-African migrants as well as locally nomadic species to the wetlands within the project area.

Overall species richness, abundance was found to be considerably higher within the Phase 2 Site. This is attributable to the higher habitat diversity, structural complexity and nutrient -rich waterbird foraging habitat afforded by the large permanent waterbodies within the Phase 2 Site. Additionally, the Phase 2 Wetland habitat supports the highest avian diversity and a species assemblage that is distinctly unique from the other identified habitats (which were mainly comprised of habitat generalists and as such these habitats could not be distinguished from one another based on species composition).

Significant is that both PV sites are capable of supporting (at least visitation) by all of the regionally occurring SCC. Most of these species are, however, likely to be non-breeding visitors that are only likely to make brief sporadic visits to forage (as they range over very large areas and will appear randomly and / or in response to favourable foraging conditions). Breeding habitat does, however, occur for two species, both of which are Threatened species. These include the Endangered African Marsh Harrier and the Vulnerable Maccoa Duck. African Marsh Harrier was detected from a wetland 3 km SW of the Phase 1 PV area and is very likely to occur at the Phase 2 Site where suitable reedbed breeding habitat is also present. Maccoa Duck is likely to breed in some of the larger waterbodies within both PV areas but most likely at the Phase 2 Site. The SCC detected during the site visit included Abdim's Stork from the south-western grasslands of the Phase 1 Site as well as Greater and Lesser Flamingo from the watercourses at the Phase 2 Site.

To better inform the sensitivity assessment, a list of collision prone species was identified. Abundance data on all collision prone species was collected during fieldwork and the information was used to identify potential collision and electrocution hotpots. Two main, high intensity collision hotspots are identified at the PV Sites. The first is the large waterbody bordering the northern end of the Phase 1 Site and the other (more significant) hotpot is associated with the large (yet shallower) permanent waterbodies at the Phase 2 Site.

Additionally, data on numbers of commuting individuals of each species and flight direction helped to identify the prevailing flight paths at each PV site. Although two flight paths are identified at the Phase 1 Site, these supported low abundances of commuting waterfowl and it is the broad, well used flight path in Phase 2 that is of greater significance. This flight path occurs in the eastern-most transformer block area and is so highly utilised as it links the large shallow highly frequented central wetland with a significant evening roost to the south-east and other panveld habitat beyond the Project area to the north.

12.6 Agricultural Impact Assessment

A summary of the Agricultural Impact Assessment (Index, 2020) (contained in **Appendix H4**) follows.

12.6.1 Details of the Specialist

The details of the specialist that undertook the Agricultural Impact Assessment follow.

Organisation:	Index
Name:	Dr A. Gouws
Qualifications:	PhD Integrated Land Use Modelling
Affiliation (if applicable):	▪ Council of Natural Sciences.No:400036/93, Category: Agricultural sciences. ▪ Member of the Soil Science Society of South Africa

12.6.2 Objectives of the Study

The key issues that were considered in the agricultural assessment include the following:

- Loss of high potential agricultural land and cultivated areas;
- Loss of grazing land;
- Loss of agricultural infrastructure;
- Impacts of the Project from an agricultural perspective; and
- Suitable mitigation measures to address the identified impacts.

12.6.3 Methodology

The present land uses were identified from various satellite images, dated from 2010 to 2020. A site visit took place on 22 October 2020 to confirm the land uses and to undertake a soil survey. Soils were classified according to the binomial soil classification system for South Africa. Land capability classification was then undertaken by using the classical eight class system of Montgomery. This is also the system used by the Department of Agriculture.

12.6.4 Key Findings of the Study

12.6.4.1 Agricultural Land Use

The current land uses associated with the PV Sites are shown in **Figure 88** below. From historical satellite images it can be concluded that the land uses have been consistent over the past 10 years.

The main uses are as follows (see **Figure 88** below):

- Phase 1 Site –
  - The entire site is grazing land. Of the 600 hectares the site comprises, 425 hectares are under grazing. The balance is buildings and mining remains that is not suitable for farming. A small cultivated field of 10 hectares that is now fallow is located on the south eastern border of the property.
- Phase 2 Site –
  - The site is 616 hectare of which 484 is grazing land. The site is use as grazing by landless farmers. The veld is severely overgrazed, even considering that it is the end of winter.
  - No land is cultivated. There are a number of pans and derelict land covered by mining debris that renders it not suitable for farming purposes.
  - The survey found at least two fairly large herds of cattle that belong to landless farmers, each herd comprises of 60 to 100 animals.

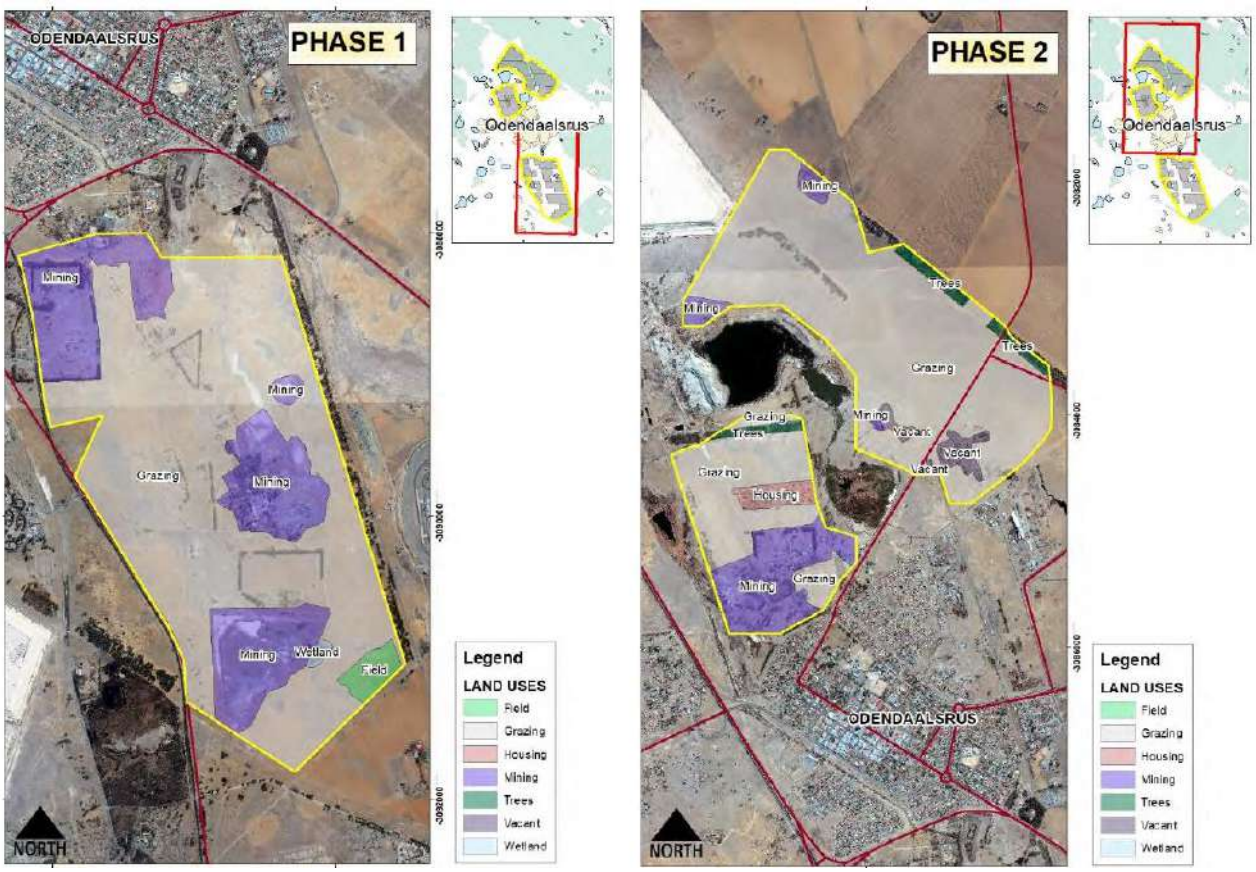


Figure 88: Land uses (Index, 2020)

12.6.4.2 Agricultural Infrastructure

There are two wooden kraals and a house on the Phase 2 Site in which one of the landless farmers stays. No other farming infrastructure was found.

12.6.4.3 Wind Erosion

The loss of topsoil in natural veld is relatively small provided that adequate vegetative cover is maintained. This implies that soil management should be in place and that the soil should not be void of cover during periods when high wind speeds are experienced.

The soil on the sites is mostly overburden of Aeolic sands, which indicates that the area has a history if wind erosion. The loss of soil in the study area is associated with human activities, and mostly, by crop farming and overgrazing. This robs the topsoil of it protective layer of vegetation. Further, organic material and humus is light and is the first to be picked up and transported by wind. When this takes place the fertility deteriorates and desertification accelerates. The negative impact of soil erosion though wind action on the ecology should not be underestimated.

12.6.4.4 Land Use Capability

Land capability classes are interpretive groupings of land with similar potential and limitations or similar hazards and involve consideration of:

- Difficulties in land use owing to physical land characteristics,
- The risks of land damage from erosion and other causes; and
- Climate.

The following was found in terms of the land capability in the Project area(see **Figure 89** below):

- Phase 1 Site –
  - Approximately 252 hectares on Phase 1 falls into Capability Class III. This is medium to low potential arable land. The majority of soils are shallow structured soils that are generally not suitable for cultivation. Derelict land resulting from mining activities is not arable and also has no or a low grazing potential. It will remain so unless rehabilitation takes place.
- Phase 2 Site –
  - The largest part of the eastern section is arable and falls into Class II and Class III capability. The size of the arable soils is 377 hectares. Although it is now used as grazing, it could potentially be cultivated with the necessary approvals.

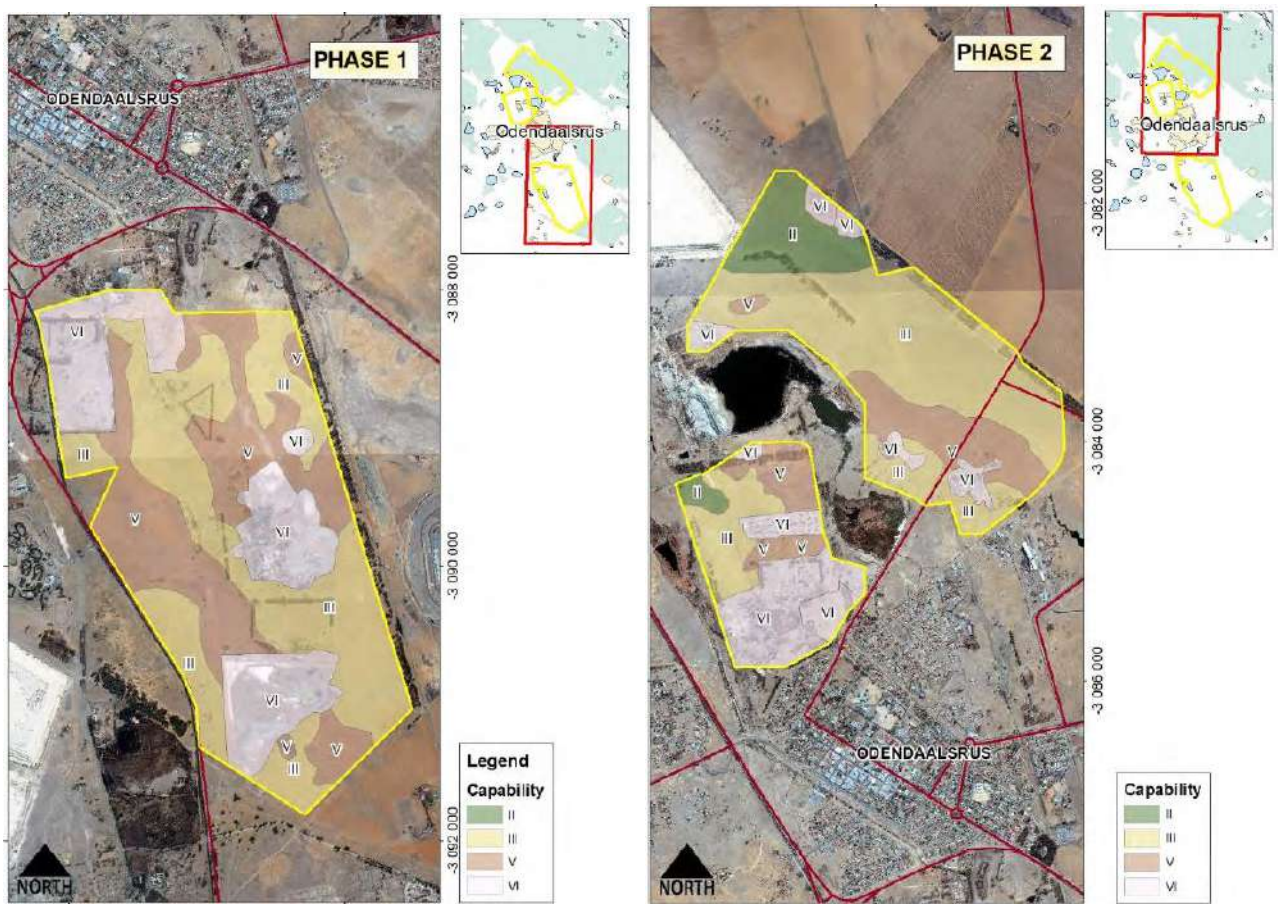


Figure 89: Land capability (Index, 2020)

12.6.4.5 Sensitivity Analysis

Figure 90 below shows the sensitivity of the PV sites from an agricultural perspective, based on the web-based environmental screening tool.

The findings of the screening tool generally were found to be accurate. **Table 24** below provides an interpretation of agricultural sensitivity according to the screening tool and the detailed assessment.

Table 24: Summary of sensitivity according to the screening tool (Index, 2020)

Sensitivity features	Feature(s)	Comment
PHASE 1		
Land capability	Moderate-High and Low-Moderate	The soil consists of aeolian sands with variable thickness. The base rock is sand and mudstone the produced structured soils. The arable soils fall into Class III capability that is medium potential land. No high potential land was identified.
Annual crop cultivation, planted pastures rotation	Moderate-High, Moderate, Low-Moderate	No cultivated land was identified. The farm is vacant and only used as informal grazing.
PHASE 2		
Land capability	High, Moderate, Low Very low	The soil consists of aeolian sands with variable thickness. Large portions of the site consist of building rubble or shallow structured soil that is not arable. The arable soils fall into Class II and III capability, which is moderately high or medium potential land.
Old Fields	Moderate-High, Low-Moderate	Historical images indicate that the land has not been cultivated for the past 10 years and is therefore virgin land according to CARA.
Annual crop cultivation, planted pastures rotation	Low-Moderate, Low, very low	No cultivated land was identified. The farm is vacant and only used as informal grazing.

12.6.5 Impact Assessment

Refer to **Section 13.15** for the results from the impact assessment from this study.

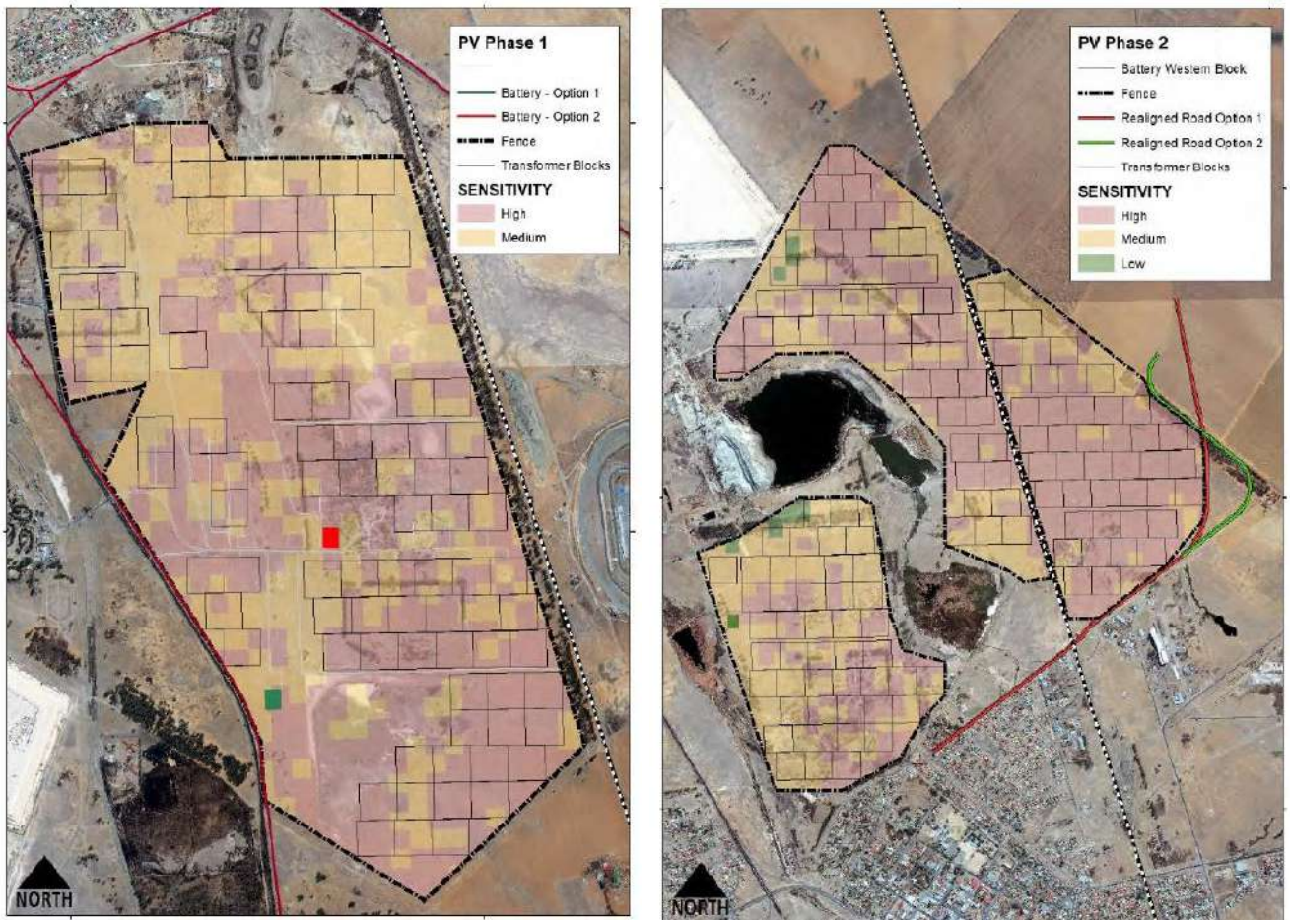


Figure 90: Agricultural sensitivity – Phase 1 Site (left) and Phase 2 Site (right) (Index, 2020)

12.7 Phase 1 Cultural Heritage Impact Assessment

A summary of the Phase 1 Cultural Heritage Impact Assessment (van Schalkwyk, 2020) (contained in **Appendix H5**) follows.

12.7.1 Details of the Specialist

The details of the specialist that undertook the Phase 1 Cultural Heritage Impact Assessment follow.

Name:	J. van Schalkwyk
Qualifications:	D Litt et Phil
Affiliation (if applicable):	Heritage Consultant: ASAPA Registration No.: 164 - Principal Investigator: Iron Age, Colonial Period, Industrial Heritage.

12.7.2 Objectives of the Study

The objectives of this study included the following:

- Identify possible archaeological, cultural and historic sites within the proposed development areas;
- Identify any potential 'fatal flaws' related to the proposed development;

- Evaluate the potential impacts of construction, operation and maintenance of the proposed development on archaeological, cultural and historical resources;
- Recommend mitigation measures to ameliorate any negative impacts on areas of archaeological, cultural or historical importance;
- Provide guideline measures to manage any impacts that might occur during the construction phase as well as the implementation phase.

12.7.3 Methodology

The methodology employed consisted of the following:

- A survey of the relevant literature was conducted with the aim of reviewing the previous research done and determining the potential of the area. In this regard, various anthropological, archaeological and historical sources were consulted.
- A survey was conducted of Heritage Impact Assessments that were undertaken for projects in the region by various heritage consultants, with the aim of determining the heritage potential of the area;
- The Heritage Atlas Database, various SAHRA databases, the Environmental Potential Atlas, the Chief Surveyor General and the National Archives of South Africa were consulted. Database surveys produced a number of sites located in the larger region of the proposed development.
- Aerial photographs and topocadastral and other maps were also studied.

12.7.4 Key Findings of the Study

12.7.4.1 Survey Results

During the physical survey, the following sites, features and objects of cultural significance were identified in the Project areas:

- Phase 1 Site –
  - No sites, features or objects of cultural significance dating to the Stone Age, Iron Age or historic period were identified in the Project area.
- Phase 2 Site –
  - No sites, features or objects of cultural significance dating to the Stone Age or Iron Age were identified in the Project area.
  - Historic period – burial site (see **Table 25** and **Figure 91** below) and structures older than 60 years (see **Table 26** and **Figure 92** below). See map in **Figure 93**.

Table 26: Burial site at the Phase 2 Site (van Schalkwyk, 2020)

NHRA Category	Graves, Cemeteries and Burial Grounds - Section 36
Type	Burial site. Farm: Dolly 404. Coordinates: S 27.84173; E 26.69366
Description	Informal burial site with five or six graves. The graves probably belong to former farm labourers. Not all have headstones with dates. The dated ones vary between 1959 and 1963.

Figure 91: **Views of the burial site at the Phase 2 Site (left - general overview of the burial site; right - close-up view of the graves) (van Schalkwyk, 2020)**

Table 26: **Structures older than 60 years at the Phase 2 Site (van Schalkwyk, 2020)**

NHRA Category	Structures older than 60 years - Section 34
Type	Farm: Paleis Heuvel 323. Coordinates: S 27.85642; E 26.67775
Description	A number of houses that used to be part of the compound for housing mine workers. From the style and materials used, it seems as if the houses date to at least two different periods. From available information it was deduced that the older section of the settlement dates to the early 1950s, having been built as the mine was first developed. The houses are still occupied, and it is the intension of the developers to relocate all the people.

Figure 92: **Views of the houses in Txolwene at the Phase 2 Site (van Schalkwyk, 2020)**

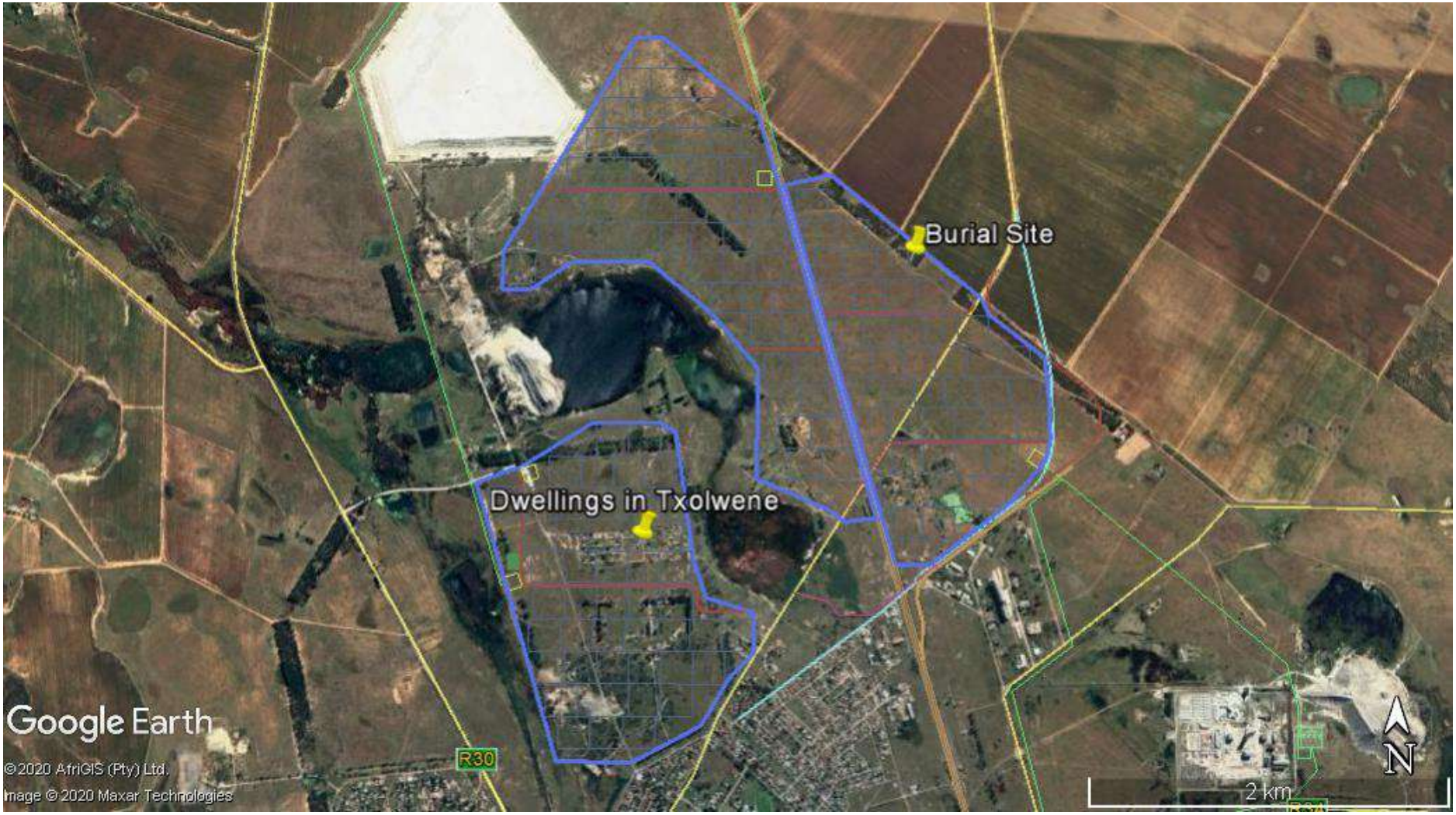


Figure 93: **Map showing burial site and houses in Txolwene at the Phase 2 Site (Google Earth image)**

12.7.5 Impact Assessment

Refer to **Section 13.16** for the results from the impact assessment from this study.

12.7.6 Conclusions

From a heritage point of view, it is recommended that the proposed development be allowed to continue on acceptance of the proposed mitigation measures are implemented.

12.8 Desktop Paleontological Assessment

A summary of the Desktop Paleontological Assessment (Banzai Environmental, 2020) (contained in **Appendix H6**) follows.

12.8.1 Details of the Specialist

The details of the specialist that undertook the Water Resources Impact Assessment follow.

Organisation:	Banzai Environmental
Name:	E. Butler
Qualifications:	MSc Zoology (specializing in Palaeontology)
Affiliation (if applicable):	Member of the Palaeontological Society of South Africa (PSSA)

12.8.2 Objectives of the Study

The general objectives of a Palaeontological Impact Assessment include the following:

- To identify the palaeontological status of the exposed as well as rock formations just below the surface in the development footprint;
- To estimate the palaeontological importance of the formations;
- To determine the impact on fossil heritage; and
- To recommend how the developer ought to protect or mitigate damage to fossil heritage.

12.8.3 Methodology

The following sources were reviewed as part of this study:

- Geological map 1:100 000, Geology of the Republic of South Africa (Visser, 1984);
- 1: 250 000 2724 Kroonstad Geological Map (Council of Geoscience);
- Spatial data of the proposed development.

12.8.4 Key Findings of the Study

The Phase 1 and Phase 2 PV Sites are primarily underlain by Caenozoic Superficial Sediments as well as a very small portion of the Bothaville Formation (Ventersdorp Supergroup, Ecca Group,

Karoo Supergroup) in the north of Phase 2 Site. According to the PalaeoMap of SAHRIS, the Palaeontological Sensitivity of the Late Cenozoic Superficial Sediments and Bothaville Formation is moderate. For this reason, it is considered that the proposed Solar development is deemed appropriate and feasible and will not lead to detrimental impacts on the palaeontological resources of the area. It is consequently recommended that no further palaeontological heritage studies, ground truthing and/or specialist mitigation are required pending the discovery of newly discovered fossils.

12.9 Visual Impact Assessment

A summary of the Visual Impact Assessment (SAS, 2020) (contained in **Appendix H8**) follows.

12.9.1 Details of the Specialist

The details of the specialist that undertook the Visual Impact Assessment follow.

Organisation:	SAS Environmental Group of Companies
Name:	Stephen van Staden
Qualifications:	MSc Environmental Management
Affiliation (if applicable):	SACNASP

12.9.2 Objectives of the Study

The Visual Impact Assessment entails a process of data collection, spatial analysis, visualisation and interpretation to describe the quality of the landscape prior to development taking place and then identifying possible visual impacts after development. Mitigation measures are also recommended to manage visual impacts.

12.9.3 Methodology

The method of assessment was based on a spatial analysis of the proposed Project area and the surrounding areas, using Geographic Information Systems (GIS), digital satellite imagery, photographs, various databases and all available data on the planned infrastructure. The desktop assessment served to guide the field assessment through identifying preliminary areas of importance in terms of potential visual impacts.

The field assessment included a drive-around and on-foot survey of the Project Sites and in the immediate vicinity thereof and a drive-around of the surrounds, in order to determine the visual context within which the proposed project is to be developed. Focus was placed on assessing the potentially sensitive receptors identified within the visual assessment zone, these included settlements, which included schools, churches and prominent roads within the area. Points from where the proposed PV plants were determined to be visible were recorded making use of Global

Positioning Systems (GPS) to confirm these aesthetically sensitive viewpoints and potential sensitive visual receptors in relation to the proposed Project.

12.9.4 Key Findings of the Study

Based on the existing infrastructure in the area, the visual assessment zone encompassed a 3 km radius of the Project Sites.

A Map indicating the location of potential visual receptors within a 3 km radius of the Phase 1 and Phase 2 Sites is provided in **Figure 94** below.

Based on the findings from both the desktop and field assessments it is evident that there are several formal and informal settlements within a 5 km radius of the proposed Project Sites. The proposed Project Sites are located within a semi-rural area interspersed with settlements that are more densely populated, mining activities and various anthropogenic structures. The topography of the proposed Project Sites is relatively flat, and dominated by grassland interspersed with tree clumps where cattle grazing and mining activities are taking place.

Even though the proposed Project Sites are situated within a semi-rural area, existing industrial structures such as powerlines and substations are present within the landscape, thus the landscape character has already been affected by industrial facilities. As such, the receptors within the surrounding area have grown accustomed to these structures, therefore the proposed Project Sites are expected to have a moderate visual impact on the landscape character within the region.

The Visual Absorption Capacity (VAC) of the area is considered moderate, indicating that the proposed Project will be absorbed in the area resulting in a moderately low visual intrusion mainly attributed to the existing infrastructure in the region. Due to the relatively low height of the proposed PV Plants, and the existing industrial infrastructure in the area, the PV Plants are likely to be absorbed in the landscape, therefore the visual intrusion of the proposed PV Plants will not be significant.

The proposed Project Sites are located within a region of medium district brightness due to surrounding settlements and mining activities. Overall, the impact significance of potential night-time lighting is expected to be moderately low and will be limited to a small area. The lighting associated with the Project Sites may potentially contribute somewhat to the effects of skyglow and artificial lighting in the region.

12.9.5 Impact Assessment

Refer to **Section 13.17** for the results from the impact assessment from this study.

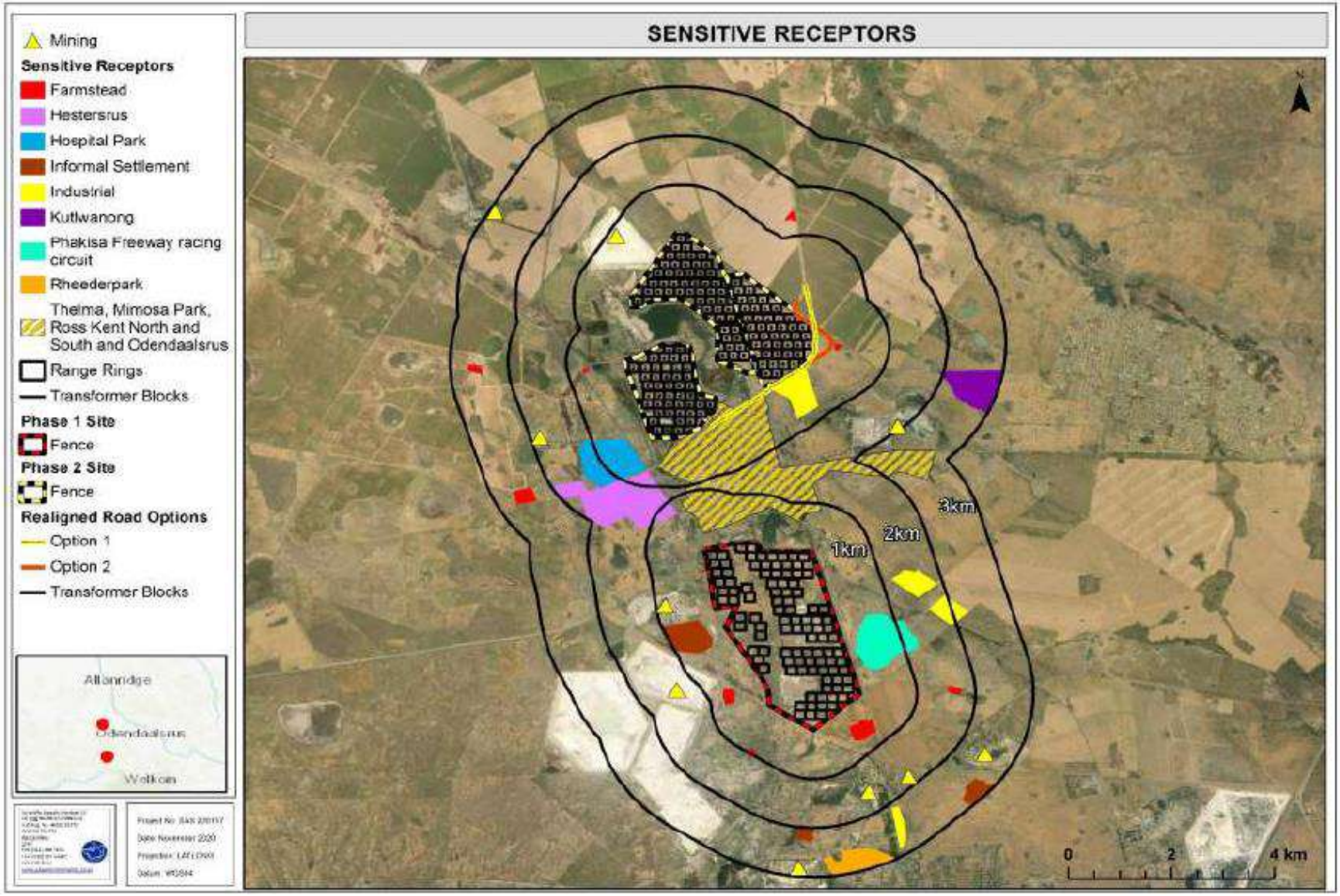


Figure 94: **Location of potential visual receptors within a 3 km radius of the Phase 1 and Phase 2 Sites (SAS, 2020)**

12.9.6 Conclusions

It is the opinion of the specialist that the Project be considered acceptable from a visual resource management perspective, provided that the recommended mitigatory measures are implemented and adhered to.

12.10 Traffic Impact Assessment

A summary of the Traffic Impact Assessment (KMA Consulting Engineers, 2020) (contained in **Appendix H9**) follows.

12.10.1 Details of the Specialist

The details of the specialist that undertook the Water Resources Impact Assessment follow.

Organisation:	KMA Consulting Engineers
Name:	K. Marais
Qualifications:	B Eng, B. Eng Hons (Civil), B Com
Affiliation (if applicable):	ECSA 920023

12.10.2 Objectives of the Study

The objectives of the study included the following:

- Provide information to the road authorities on the possible impacts of the development on the functioning of the road network; and
- Suggest suitable mitigation measures to address the identified traffic impacts.

12.10.3 Methodology

The study was in principle undertaken as per the requirements of the National Land Transport Act (Act No. 5 of 2009), and according to the procedures prescribed by the Manual for Traffic Impact Studies, Report RR93/635, South African Department of Transport, Chief Directorate Roads as well as TMH 16: South African Traffic Impact and Site Traffic Assessment Standards and Requirements Manual, COTO, 2018.

12.10.4 Key Findings of the Study

The key findings of the Traffic Impact Assessment are as follows:

- The development is not expected to generate significant trips, although there will be an increase in traffic, especially in heavy vehicle traffic, during the construction period.
- No road improvements are required from a capacity point of view.

- Access to the Phase 1 Site from the R30 as proposed (shown in **Figure 95** below) is acceptable as -
  - The site has direct access to a higher order road.
  - The intersection where access will be obtained is already developed to a relatively high standard and no geometric improvements are required.
  - Traffic generated by the site will not have a significant impact on any community.
- Access to the Phase 2: Western Block Site from the R30 as proposed (shown in **Figure 96** below) is acceptable as:
  - The site has direct access to a higher order road.
  - The intersection where access will be obtained is already developed to a relatively high standard and no geometric improvements are required.
  - Traffic generated by the site will not have a significant impact on any community.
- The proposed realignment of the A48 / S86 (shown in **Figure 97** below) to enable the utilisation of the area between the A48 and the urban area and to fence the area is not recommended due to the following –
  - It will be difficult to align the road in such a manner that geometric standards are complied with.
  - Considering road hierarchy principles, the current function of the A48/S86 as a mobility street cannot be transferred to the lower order access street (Frank Street).
  - The road reserve of Frank Street does not comply with the requirements for a U3 Urban Minor Arterial.
  - Frank Street is not physically suitable to function as a higher order mobility street and significant improvement of the street will be required.
  - As a residential local street Frank Street provides access to residential houses and the school hostel and through traffic will have a significant impact on the community.
  - The affected roads are Provincial Roads and an extensive process will have to be followed to de-proclaim the existing roads. As deproclamation is not in the interest of the community in general, approval is unlikely.
- Access to the Phase 2: Northern Block from Hauptfleish Street as proposed (shown in **Figure 98** below) is not recommended due to the following –
  - Hauptfleish Street is not accessible from any higher order roads and all routes from the higher order rural road network are through the Odendaalsrus urban area.
  - An increase in traffic and especially heavy vehicles on residential streets will affect communities and will increase the potential for accidents in areas with significant pedestrian activity.
  - Urban residential streets are not designed for significant heavy vehicles and damage to street pavements can be expected.
- Considering the fact that the only high order road in the vicinity of the Phase 2: Northern Block is the R30, it should be endeavoured to obtain access to this block via the Western Block.
- All accesses should be planned with proper throat lengths to prevent the protruding of queued vehicles into public roads at access control points.

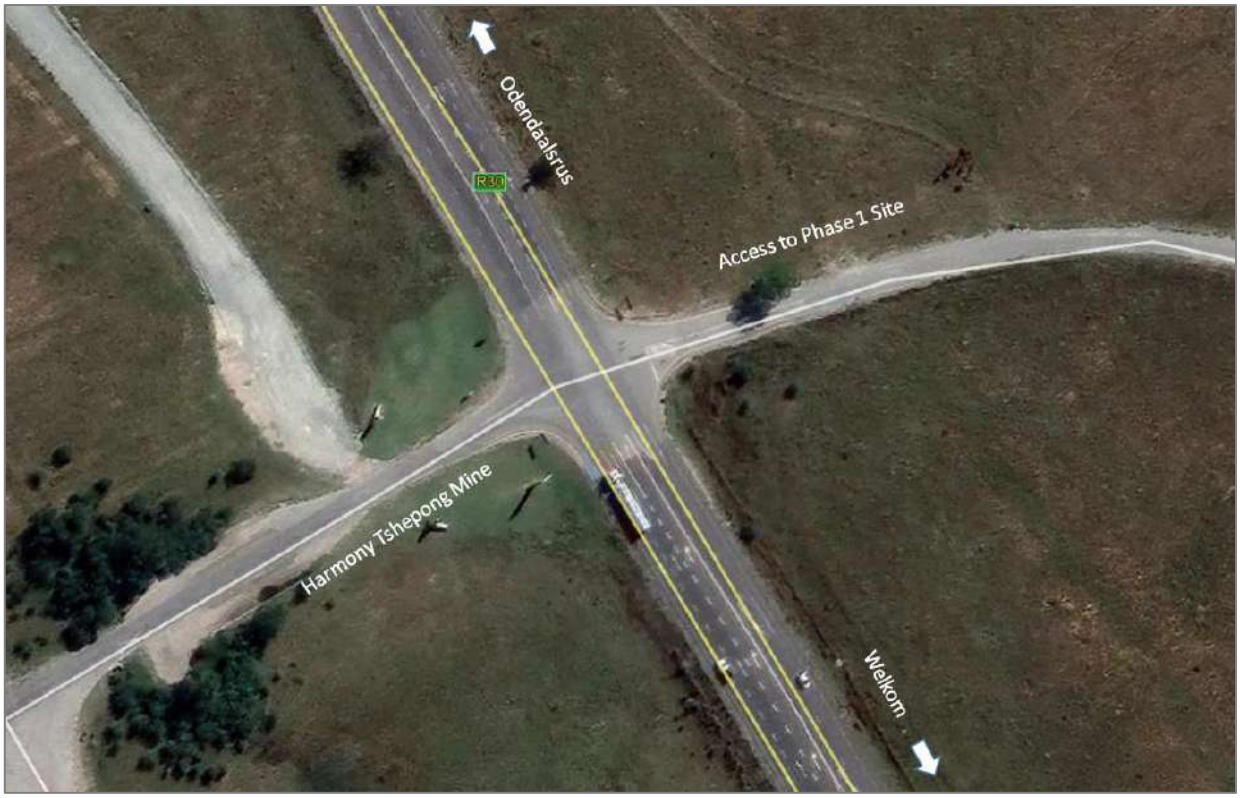


Figure 95: **Existing intersection to be used as access to Phase 1 Site (KMA Consulting Engineers, 2020)**

Figure 96: **Existing intersection to be used as access to Phase 2 Western Block (KMA Consulting Engineers, 2020)**

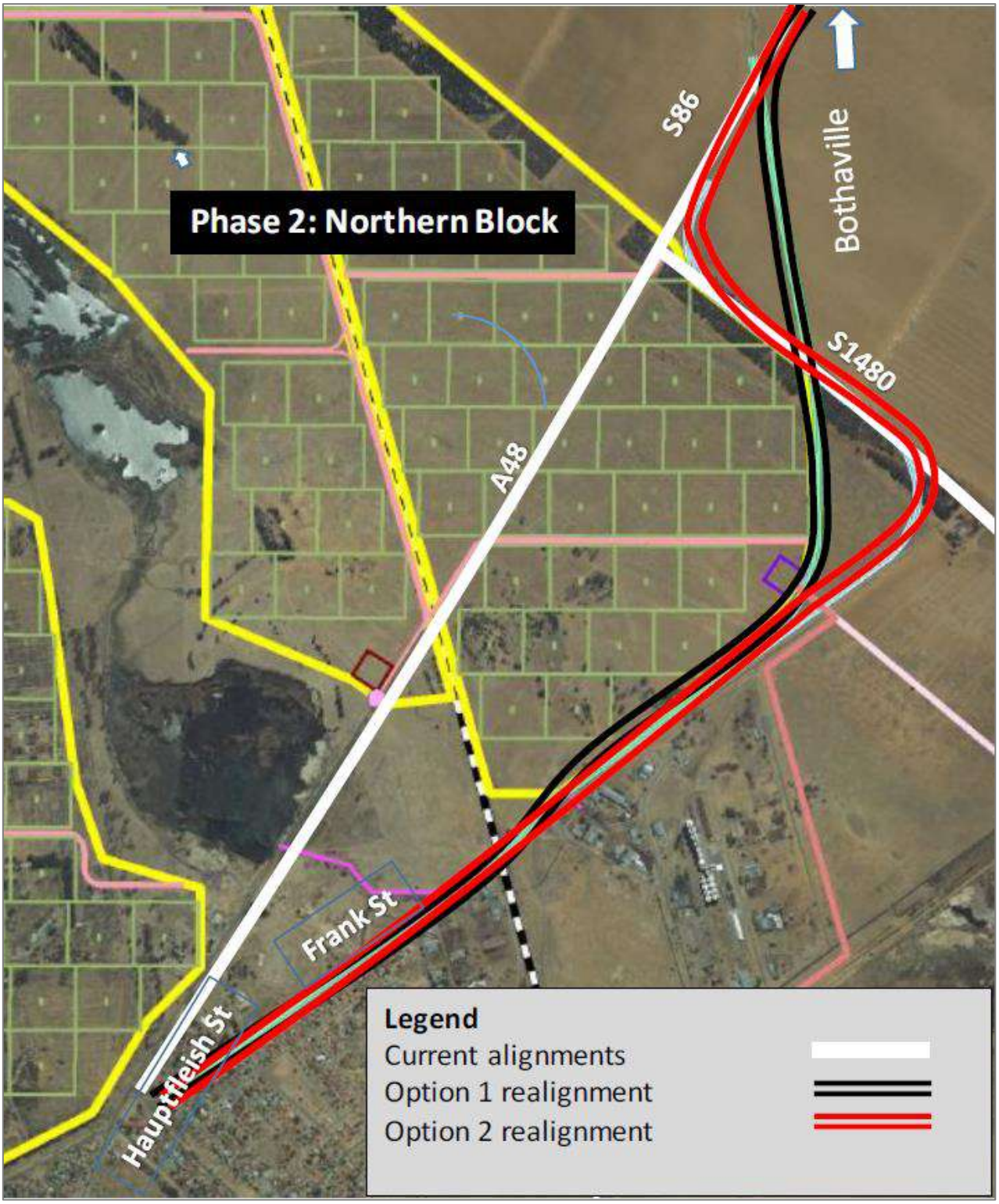


Figure 97: **Proposed A48 / S86 realignment options (KMA Consulting Engineers, 2020)**

Figure 98: **Recommended Access to Phase 2: Western Block & Northern Block (KMA Consulting Engineers, 2020)**

12.10.5 Impact Assessment

Refer to **Section 13.21** for the results from the impact assessment from this study.

12.10.6 Conclusions

In summary, from a traffic point of view, the following are recommended:

- Access points to the Phase 1 Site and Phase 2 Western Block, as proposed, are in acceptable positions and traffic generated by the development sites will not have a significant impact on any community.
- The proposed re-alignment of the A48 / S86 to accommodate the Phase 2 Northern Block is not recommended.
- The proposed access to the Phase 2 Northern Block from Hauptpleish Street is not recommended and an alternative direct route to the R30 should be established.

12.11 Radiological Survey

A summary of the Radiological Survey (SciRAD Consulting, 2020) (contained in **Appendix H10**) follows.

12.11.1 Details of the Specialist

The details of the specialist that undertook the Radiological Survey follow.

Organisation:	SciRAD Consulting
Name:	Dr. D. de Villiers
Qualifications:	PhD Nuclear Physics
Affiliation (if applicable):	Pr. Sci.Nat.; Pr. Phys.; Radiation Protection Specialist

12.11.2 Objectives of the Study

In 2015 a Radiological Screening Survey was undertaken at four areas (shown in **Figure 29** above) located on the proposed PV Sites, where possible radioactive material was found (SciRAD Consulting, 2015). The report indicated that the tailings material exceeded the 0.5 Bq/g exclusion level set by the NNR (DME, 2006). The tailings material found at these specific areas was therefore classified as radioactive. It was recommended that for the Applicant to obtain release from regulatory control (i.e. NNR clearance) to use the Sites, the radioactive tailings needed to be removed. The survey results for the waste rock dump indicated that the material was not considered radioactive, and therefore not a concern.

A follow on Radiological Survey was undertaken at the PV Sites where radioactive material was previously found. The aim was to investigate whether the material was removed and if so, what are the current radiological statuses of these areas.

12.11.3 Methodology

Naturally occurring radioactivity is found in the sands, soils, and minerals in the earth's crust in the form of potassium-40, uranium-238, uranium-235, thorium-232 and their daughter products. These radionuclides emit gamma radiation as well as alpha and beta particles during their decay. The radiological survey only includes the direct measurement of the gamma radiation to assess the activity concentrations of the gamma emitters in the soil. No samples of tailings material were collected.

The gamma survey entailed the measurement of the gamma radiation with a calibrated RS-230 spectrometer at a height of 1 meter above the soil/material. The survey was conducted at accessible areas on or around the following sources (indicated in **Figure 29** above):

- Kalkuil South Tailings (26°41'47.80"E, 27°54'41.37"S),
- Kalkuil North Tailings (26°41'57.69"E, 27°53'56.40"S), and

- Existing Tailings (26°40'28.15"E, 27°50'11.96"S).

The waste rock dump (coordinates: (26°40'15.69"E, 27°51'0.51"S)) was not surveyed as Harmony Gold/contractors are currently actively removing material from this area.

12.11.4 Key Findings of the Study

Survey results indicated that radioactive tailings are still present on the PV Sites.

While the current effort is to remove the waste rock from the proposed sites, the tailings material is still present. Of concern is the uranium-238 decay chain radionuclides which exceed the 0.5 Bq/g exclusion criteria as set by the NNR. Due to the long half-lives of the radionuclides in the tailings, waiting to remove the tailings will not reduce the radioactivity. For example, based on the sample results, the radium-226 (half-life of 1 600 years) will only reduce to below 0.5 Bq/g in nearly 5 000 years. Since the radium-226 is before other radionuclides in the chain (e.g. lead-210), they in turn would only start to reduce after this period.

The Applicant should take cognisance of the fact that since these sites are classified as former mine land, these sites will not be released from NNR regulatory control until these tailings have been removed or used in an approved manner. It is recommended that when the tailings material is removed, a follow-up survey is conducted to verify that the activity concentrations in the respective areas are indeed below 0.5 Bq/g. Also note that the NNR may request, if not already performed by Harmony Gold Mining Company Limited, that a public safety assessment/land clearance assessment be conducted for the future site use before a land clearance certificate is issued.

12.12 Socio-Economic Impact Assessment

A summary of the Socio-Economic Impact Assessment (Nemai Consulting, 2020) (contained in **Appendix H7**) follows.

12.12.1 Details of the Specialist

The details of the specialist that undertook the Socio-Economic Impact Assessment follow.

Organisation:	Nemai Consulting
Name:	C. Chidley
Qualifications:	BA (Economics); BSc Eng (Civil); MBA

12.12.2 Objectives of the Study

The key objectives of the Socio-Economic Impact Assessment included the following:

- Collecting baseline data on the current socio-economic environment.

- Assessing the socio-economic impacts (positive and negative) of the Project;
- Considering the outcomes of the public participation process to date;
- Suggesting suitable mitigation measures to address the identified impacts; and
- Making recommendations on preferred options from a socio-economic perspective (if relevant).

12.12.3 Methodology

The Socio-Economic Impact Assessment set out the socio-economic baseline of the study area, predicted social impacts on the Project and made recommendations for mitigating impacts. The socio-economic baseline level was based on both primary and secondary data. The primary data was collected directly from the community members, community leaders, and private farmers. Secondary data was accessed through South African Databases, available reports and articles, as well as internet searches.

The profile of the baseline conditions included describing the current status quo of the community, including information on a number of social and economic issues such as:

- Demographic factors;
- Socio-economic factors such as income and population data;
- Access to services;
- Institutional environment;
- Social Organisation (Institutional Context); and
- Statutory Regulatory Environment.

12.12.4 Key Findings of the Study

The following concerns were noted by the Councillors with regards to the proposed power lines and substations:

- Socio-economic benefits: The Councillors noted that the community members in the area are largely unemployed. The mining sector in the area employs some people from the surrounding communities. The Councillors were interested in the potential employment opportunities. It was pointed out that the Project should try to employ locally-based labour, possibly using the Expanded Public Works Programme model as well as using local companies (SMME's). As far as possible, importing labour from outside the affected areas should be avoided. In addition, skills development programmes and certifications to create long term skills within the community was noted as an expectation from the Project;
- Project Awareness: The Councillors expressed the need to know more about the Project;
- Duration of the Project: The Councillors enquired about the duration of employment contracts for the members of the community.

The following socio-economic implications of the Project were identified:

- High Risk Activities –

- Land and Servitude Rights Acquisition (where necessary, having regard to existing structures located within both the Phase 1 and Phase 2 Sites);
- Impacts of construction work on local communities.

❖ Lower Risk Activities –

- Operation and maintenance of the Solar PV Plant;
- Maintenance of the roads; and
- Rehabilitation of the cleared vegetation

12.12.5 Impact Assessment

Refer to **Section 13.25** for the results from the impact assessment from this study.

12.12.6 Conclusions

The study assessed the social and economic impacts of the proposed Project. As expected, there were several positive and negative socio-economic impacts identified.

No socio-economic fatal flaws were identified. The negative impacts can be successfully mitigated, and the positive impacts will bring economic and social benefit to the area.

13 IMPACT ASSESSMENT

13.1 General

This section focuses on the pertinent environmental impacts that could potentially be caused during the pre-construction, construction and operational phases of the Phase 1 and Phase 2 Sites.

Note that an 'impact' refers to the change to the environment resulting from an environmental aspect (or activity), whether desirable or undesirable. An impact may be the direct or indirect consequence of an activity.

Impacts were identified as follows:

- Impacts associated with listed activities contained in GN No. R. 983, R. 984 and R. 985 of 4 December 2014, as amended, for which Environmental Authorisation have been applied for;
- Impacts identified during the Scoping phase;
- An appraisal of the Project's activities and components;
- An assessment of the receiving biophysical, social, economic and built environments;
- Findings from specialist studies;
- Issues highlighted by environmental authorities; and
- Comments received during public participation from IAPs.

13.2 Impacts associated with Listed Activities

As mentioned, the Project requires Environmental Authorisation for certain activities listed in the EIA Regulations of 2014 (as amended), which serve as triggers for the EIA. The potential impacts associated with the key listed activities are broadly stated in **Table 27** below.

Table 27: Potential Impacts associated with the key listed activities

Listed Activities	Potential Impact Overview
GN No. R. 983 of 4 December 2014 (as amended) (Listing Notice 1)	
GN No. R.983 – Activity no. 9(i) & (ii): The development of infrastructure exceeding 1000 metres in length for the bulk transportation of water or storm water- (i) with an internal diameter of 0,36 metres or more; or (ii) with a peak throughput of 120 litres per second or more; excluding where- (a) such infrastructure is for bulk transportation of water or storm water or storm water drainage inside a road reserve; or (b) where such development will occur within an urban area.	• Impacts associated with the footprint of the physical infrastructure (proposed stormwater drainage system). • Effects to resource quality (i.e. flow, in-stream and riparian habitat, aquatic biota and water quality) associated with traversing or working in close proximity to watercourses, as well as discharging of stormwater. • Potential loss of sensitive environmental features (e.g. heritage resources, sensitive fauna and flora species). • Visual and socio-economic impacts during construction.

Listed Activities	Potential Impact Overview
GN No. R.983 – Activity no. 12(ii)(a - c): The development of - (i) dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100 square metres; or (ii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs - (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse; - excluding - (aa) the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour; (bb) where such development activities are related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies; (cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 14 in Listing Notice 3 of 2014, in which case that activity applies; (dd) where such development occurs within an urban area; (ee) where such development occurs within existing roads, road reserves or railway line reserves; or (ff) the development of temporary infrastructure or structures where such infrastructure or structures will be removed within 6 weeks of the commencement of development and where indigenous vegetation will not be cleared.	• Impacts associated with the footprint of the physical infrastructure within 32 m of a watercourse. • Adverse effects to resource quality (i.e. flow, in-stream and riparian habitat, aquatic biota and water quality) associated with working in-stream and alongside watercourses. • Loss of riparian and instream vegetation within construction domain. • Destabilisation of affected watercourses. • Reduction in water quality of receiving watercourses due to improper management of storm water, hazardous material and sanitation. • Altering the drainage of the site.
GN No. R.983 – Activity no. 14: *The development of facilities or infrastructure, for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 cubic metres or more but not exceeding 500 cubic metres.*	• Pollution of bio-physical environment and risks posed to human health through poor practices associated with onsite storage of dangerous goods (BESS). • Impacts caused by fire, explosion or leaks resulting from the BESS.
GN No. R.983 – Activity no. 19: *The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse;* *but excluding where such infilling, depositing, dredging, excavation, removal or moving -* *(a) will occur behind a development setback;* *(b) is for maintenance purposes undertaken in accordance with a maintenance management plan;* *(c) falls within the ambit of activity 21 in this Notice, in which case that activity applies;* *(d) occurs within existing ports or harbours that will not increase the development footprint of the port or harbour; or* *(e) where such development is related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies.*	• Construction activities (including bulk earthworks) to be undertaken within watercourses for physical infrastructure. • Adverse effects to resource quality (i.e. flow, in-stream and riparian habitat, aquatic biota and water quality) associated with working in-stream and alongside the watercourse. • Destabilisation of affected watercourses.
GN No. R.983 – Activity no. 24(ii): *The development of a road -* *(i) for which an environmental authorisation was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Government Notice 545 of 2010; or*	• Impacts associated with access roads. • Potential loss of sensitive environmental features (e.g. heritage resources, sensitive fauna and flora species). • Traffic disruptions during construction. • Impacts to watercourses at crossings.

Listed Activities	Potential Impact Overview
(ii) with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres; *but excluding a road -* *(a) which is identified and included in activity 27 in Listing Notice 2 of 2014;* *(b) where the entire road falls within an urban area; or* *(c) which is 1 kilometre or shorter.*	• Impacts associated with the proposed realignment of the A48 / S86 road.
GN No. R.983 – Activity no. 26: *Residential, retail, recreational, tourism, commercial or institutional developments of 1 000 square metres or more, on land previously used for mining or heavy industrial purposes; -* *excluding -* *(i) where such land has been remediated in terms of part 8 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the National Environmental Management: Waste Act, 2008 applies; or* *(ii) where an environmental authorisation has been obtained for the decommissioning of such a mine or industry in terms of this Notice or any previous NEMA notice; or* *(iii) where a closure certificate has been issued in terms of section 43 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) for such land.*	• Impacts associated with developing on land previously used for mining, including existing mining infrastructure, areas disturbed by mining and risks posed by radioactive material.
GN No. R.983 – Activity no. 28(i) & (ii): Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture, game farming, equestrian purposes or afforestation on or after 01 April 1998 and where such development: (i) will occur inside an urban area, where the total land to be developed is bigger than 5 hectares; or (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare; excluding where such land has already been developed for residential, mixed, retail, commercial, industrial or institutional purposes.	• Clearance of large areas associated with the construction footprint of the PV Sites and associated infrastructure. • Loss of agricultural land. • Socio-economic impacts associated with construction activities.
GN No. R.983 – Activity no. 45(i) & (ii): The expansion of infrastructure for the bulk transportation of water or storm water where the existing infrastructure - (i) has an internal diameter of 0,36 metres or more; or (ii) has a peak throughput of 120 litres per second or more; and (a) where the facility or infrastructure is expanded by more than 1 000 metres in length; or (b) where the throughput capacity of the facility or infrastructure will be increased by 10% or more; excluding where such expansion - (aa) relates to transportation of water or storm water within a road reserve or railway line reserve; or (bb) will occur within an urban area.	• Impacts associated with the footprint of the physical infrastructure (proposed stormwater drainage system). • Effects to resource quality (i.e. flow, in-stream and riparian habitat, aquatic biota and water quality) associated with traversing or working in close proximity to watercourses, as well as discharging of stormwater. • Potential loss of sensitive environmental features (e.g. heritage resources, sensitive fauna and flora species). • Visual and socio-economic impacts during construction.
GN No. R.983 – Activity no. 48(i)(a - c): The expansion of - (i) infrastructure or structures where the physical footprint is expanded by 100 square metres or more; or (ii) dams or weirs, where the dam or weir, including infrastructure and water surface area, is expanded by 100 square metres or more;	• Impacts associated with expanding existing access roads within 32 m of watercourses. • Adverse effects to resource quality (i.e. flow, in-stream and riparian habitat, aquatic biota and water quality) associated with working in-stream and alongside watercourses.

Listed Activities	Potential Impact Overview
where such expansion occurs - (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse; Excluding - (aa) the expansion of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour; (bb) where such expansion activities are related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies; (cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 14 in Listing Notice 3 of 2014, in which case that activity applies; (dd) where such expansion occurs within an urban area; or (ee) where such expansion occurs within existing roads, road reserves or railway line reserves.	• Loss of riparian and instream vegetation within construction domain. • Destabilisation of affected watercourses. • Reduction in water quality of receiving watercourses due to improper management of storm water, hazardous material and sanitation.
GN No. R.983 – Activity no. 56(i) & (ii): The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre- (i) where the existing reserve is wider than 13,5 meters; or (ii) where no reserve exists, where the existing road is wider than 8 metres; excluding where widening or lengthening occur inside urban areas.	• Impacts associated with the widening or lengthening of existing roads to create access roads. • Potential loss of sensitive environmental features (e.g. heritage resources, sensitive fauna and flora species). • Traffic disruptions. • Impacts to watercourses at crossings.
GN No. R. 984 of 4 December 2014 (as amended) (Listing Notice 2)	
GN No. R.984 – Activity no. 1: *1. The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more, excluding where such development of facilities or infrastructure is for photovoltaic installations and occurs -* *(a) within an urban area; or* *(b) on existing infrastructure.*	• Impacts associated with generating electricity by the Solar PV Plants at the Phase 1 and Phase 2 Sites. • Impacts associated with the footprint of the physical infrastructure. • Impacts to land use. • Potential loss of sensitive environmental features (e.g. heritage resources, sensitive fauna and flora species). • Visual impacts. • Soil destabilisation and subsequent erosion. • Proliferation of alien and invasive species. • Socio-economic impacts. • Traffic impacts.
GN No. R.984 – Activity no. 4: *The development and related operation of facilities or infrastructure, for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of more than 500 cubic metres.*	• Pollution of bio-physical environment and risks posed to human health through poor practices associated with onsite storage of dangerous goods (BESS). • Impacts caused by fire, explosion or leaks resulting from the BESS.
GN No. R.984 – Activity no. 15: *The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for-* *(i) the undertaking of a linear activity; or* *(ii) maintenance purposes undertaken in accordance with a maintenance management plan.*	• Clearance of large areas of indigenous vegetation associated with the construction footprint of the PV Sites and associated infrastructure. • Potential loss of sensitive environmental features (e.g. sensitive fauna and flora species). • Visual impacts.

Listed Activities	Potential Impact Overview
	• Soil destabilisation and subsequent erosion. • Proliferation of alien and invasive species. • Socio-economic impacts associated with construction activities.
GN No. R. 985 of 4 December 2014 (as amended) (Listing Notice 3)	
GN No. R.985 – Activity no. 4 - (b)(i)(ee): The development of a road wider than 4 metres with a reserve less than 13,5 metres. b. Free State i. Outside urban areas: (ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans.	Impacts associated with building access roads through CBAs, including loss of biodiversity.
GN No. R.985 – Activity no. 12 - (b)(i), (ii) & (iv): The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan. b. Free State i. Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004; ii. Within critical biodiversity areas identified in bioregional plans; iv. Areas within a watercourse or wetland; or within 100 metres from the edge of a watercourse or wetland.	The clearance of large tracts of indigenous vegetation and potential loss of sensitive fauna and flora species within areas consisting of endangered ecosystems, CBAs and within 100 m from the edge of a watercourse or wetland.
GN No. R.985 – Activity no. 14(ii)(a - c) - (b)(i)(ff): The development of— (i) dams or weirs, where the dam or weir, including infrastructure and water surface area exceeds 10 square metres; or (ii) infrastructure or structures with a physical footprint of 10 square metres or more; where such development occurs— (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse; excluding the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour. b. Free State i. Outside urban areas: (ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans.	• Impacts to biodiversity within CBAs as a result of the development of infrastructure within watercourses / within 32 m from watercourses, including access roads, stormwater system, transformer blocks and associated infrastructure and structures. • Effects to resource quality (i.e. flow, in-stream and riparian habitat, aquatic biota and water quality) associated with working in-stream and alongside the watercourses within CBAs.
GN No. R.985 – Activity no. 18 - (b)(i)(ee) & (hh): The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre.	Impacts to biodiversity within CBAs and within 100 m from the edge of a watercourse or wetland, as a result of the widening and lengthening of access roads to the sites (construction and operational phases).

Listed Activities	Potential Impact Overview
b. Free State i. Outside urban areas: (ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans; (hh) Areas within a watercourse or wetland; or within 100 metres from the edge of a watercourse or wetland.	
GN No. R.985 – Activity no. 23(ii)(a) & (c) - (b)(i)(ee): The expansion of - (i) dams or weirs where the dam or weir is expanded by 10 square metres or more; or (ii) infrastructure or structures where the physical footprint is expanded by 10 square metres or more; where such expansion occurs - (a) within a watercourse; (b) in front of a development setback adopted in the prescribed manner; or (c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse; excluding the expansion of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour. b. Free State i. Outside urban areas: (ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans.	• Impacts to biodiversity within CBAs as a result of the upgrading of watercourse crossings along access roads, within 32 m of watercourses • Effects to resource quality (i.e. flow, in-stream and riparian habitat, aquatic biota and water quality) associated with working in-stream and alongside the watercourses.

13.3 Issues raised by Environmental Authorities and IAPs

The issues raised by authorities (both regulatory and commenting) and IAPs to date during the execution of the EIA are captured and addressed in the Comments and Responses Report (refer to **Appendix J**).

The consolidated issues raised by authorities and IAPs have been succinctly grouped into the following main categories (*Note: please refer to the Comments and Response Report for a comprehensive and accurate representation of the issues raised*):

- Land use –
  - Application in terms of Section 53 of MPRDA for use of land surface rights within mining areas;
  - Updated letter from MLM (landowner consent);
  - Update with regards to the application for the change of land use;
  - Consent from mining company;
  - Status of mining activities; and
  - Tripartite Rehabilitation Agreement.
- Water use –

- Application in terms of the NWA for water uses.

❖ Socio-economic impacts –
- Impact on the Odendaalsrus community.

❖ Ecology –
- Compliance with BirdLife SA Guideline;
- Adjustment of final layouts of the Phase 1 and Phase 2 Sites to avoid areas of sensitivity;
- Rehabilitation;
- Management of erosion;
- Management of alien plants;
- Consider the Free State Biodiversity Plan and other environmental management planning tools.

❖ Radiological Study –
- Updated information.

❖ BESS –
- Technical details.

❖ Existing infrastructure –
- Impacts to existing infrastructure (power lines, telephone lines, roads, pipelines, civil aviation, etc.).

❖ Cultural Heritage & Palaeontological Features –
- Impacts to cultural heritage and palaeontological features.

❖ EIA Process –
- Combined Application;
- Listed activities;
- Need for amended application form.

❖ Public participation –
- Public participation to take heed of the National State of Disaster and associated requirements;
- Recording and addressing comments from stakeholders.

These issues received further attention during the investigations in the EIA phase, including the environmental and technical specialist studies.

13.4 Project Activities

In order to understand the impacts related to the Project it is necessary to unpack the activities associated with the project life-cycle, as done in the sub-sections to follow.

13.4.1 Project Phase: Pre-construction

Some of the main Project activities, as well as high-level environmental activities, to be undertaken in the pre-construction phase are listed in **Table 28** below.

Table 28: Simplified List of Activities associated with Pre-construction Phase

Project Phase: Pre-construction
Project Activities
• Negotiations and agreements with the affected landowner (MLM), occupiers of land (via MLM), stakeholders and authorities
• Lease Agreement
• Completion of rehabilitation activities related to historical mining areas, including radiological sources, by Harmony Gold Mining Company Ltd
• Undertake a follow-up survey once the tailings material has removed (based on Radiological Screening Survey) to verify that the activity concentrations in the respective areas are below 0.5 Bq/g
• Removal of informal dwellings and illegal dumping areas on the sites, as well as relocating the people residing in the old mine houses, by MLM
• Relocation of landless farmers utilising the sites for grazing of livestock, by MLM
• Detailed engineering design
• Detailed geotechnical investigations, including geophysical investigations
• Survey and mark development
• Survey and map topography for determination of post-construction landscape, rehabilitation and shaping (where necessary)
• Procurement process for Contractor
• Review Contractor's method statements (as relevant)
• Establish new access roads and undertake selective improvements to existing access roads to facilitate the delivery of construction plant and materials
• Arrangements for accommodation of construction workers (off site)
• The building of a site office and ablution facilities
• Confirmation of the location and condition of all structures and infrastructure on the PV Sites
• Determining and documenting the conditions of the roads to be used during construction
• Fencing off PV Sites
High Level Environmental Activities
• Diligent compliance monitoring of the EMPr, Environmental Authorisation and other relevant environmental legislation
• Pre-construction environmental survey
• Develop Environmental Monitoring Programme (air quality, water quality, noise, traffic, social)
• Barricading of sensitive environmental features (e.g. graves)
• Obtain permits for impacts to SCC, if avoidance is not possible
• Obtain permits if heritage resources are to be impacted on and for the relocation of graves
• On-going consultation with IAPs
• Other activities as per EMPr

13.4.2 Project Phase: Construction

Some of the main Project activities, as well as high-level environmental activities, to be undertaken in the construction phase are listed in **Table 29** below.

Table 29: Simplified List of Activities associated with Construction Phase

Project Phase: Construction
Project Activities
• Site establishment
• Relocation of existing structures and infrastructure

Project Phase: Construction
• Prepare access roads
• Establish construction laydown areas
• Bulk fuel storage
• Delivery of construction material
• Transportation of equipment, materials and personnel
• Storage and handling of material
• Construction employment
• Site clearing (as necessary)
• Excavation
• Concrete Works
• Mechanical and Electrical Works
• Electrical supply
• Material delivery and offloading
• Construction of PV Plant infrastructure
• Stockpiling
• Waste and wastewater management
High Level Environmental Activities
• Diligent compliance monitoring of the EMPr, Environmental Authorisation and other relevant environmental legislation
• Implement Environmental Monitoring Programme (air quality, water quality, noise, traffic, social)
• Reinstatement and rehabilitation of construction domain (as necessary)
• On-going consultation with IAPs
• Other activities as per EMPr

13.4.3 Project Phase: Operation

Some of the main Project activities, as well as high-level environmental activities, to be undertaken in the operational phase are listed in **Table 30** below.

Table 30: Simplified List of Activities associated with Operational Phase

Project Phase: Operation
Project Activities
• Testing and commissioning the facility's components
• Cleaning of PV modules
• Controlling vegetation
• Managing stormwater and waste
• Conducting preventative and corrective maintenance
• On-going consultation with directly affected parties
• Monitoring of the facility's performance
High Level Environmental Activities
• On-going consultation with IAPs
• Other activities as per EMPr for Operational Phase

13.5 Environmental Aspects

Environmental aspects are regarded as those components of an organisation's activities, products and services that are likely to interact with the environment and cause an impact.

The environmental aspects that have been identified for the proposed Project, which are linked to the project activities, are provided in **Table 31** below. Note that only high level aspects are provided.

Table 31: Environmental Aspects associated with Project Life-Cycle

Project Phase: Pre-construction
Environmental Aspects
• Inadequate consultation with landowner / occupiers of land (informal settlers and landless farmers)
• Improper relocation of occupiers of land (informal settlers and landless farmers)
• Inadequate rehabilitation of areas affected by historical mining
• Failure to prevent risks associated with radiological sources
• Inadequate environmental and compliance monitoring
• Poor construction site planning and layout
• Land occupancy by temporary buildings, provisional on-site facilities and storage areas
• Inaccurate pre-construction environmental survey
• Absence of relevant permits (e.g. for protected trees, heritage resources)
• Lack of barricading of sensitive environmental features
• Poor waste management
• Absence of ablution facilities

Project Phase: Construction
Environmental Aspects
• Inadequate consultation with landowner
• Inadequate environmental and compliance monitoring
• Lack of environmental awareness creation
• Indiscriminate site clearing
• Poor site establishment
• Poor management of access and use of access roads
• Disruptions to traffic
• Poor transportation practices
• Poor fencing arrangements
• Erosion
• Disruptions to existing services
• Disturbance of topsoil
• Poor management of excavations
• Inadequate storage and handling of material
• Inadequate storage and handling of hazardous material
• Poor maintenance of equipment and plant
• Poor management of labour force
• Pollution from ablution facilities
• Inadequate management of construction camp

Project Phase: Construction
• Poor waste management practices – hazardous and general solid, liquid
• Wastage of water
• Disturbance to occupiers of land
• Disturbance to mining infrastructure to remain on the site
• Poor management of pollution generation potential
• Damage to significant flora (if encountered)
• Damage to significant fauna (if encountered)
• Environmental damage where watercourses are crossed
• Inadequate stormwater management
• Environmental damage of sensitive areas
• Damage to cultural heritage and palaeontological features (if encountered)
• Poor reinstatement and rehabilitation

Project Phase: Operation
Environmental Aspects
• Inadequate environmental and compliance monitoring
• Inadequate management of access, routine maintenance and maintenance works
• Inadequate management of vegetation
• Inadequate stormwater management
• Pollution caused by cleaning of panels
• Impacts caused by fire, explosion or leaks associated with BESS
• Inadequate management of light pollution
• Failure to comply with health, safety and environmental specifications

13.6 Potentially Significant Environmental Impacts

Environmental impacts are the change to the environment resulting from an environmental aspect, whether desirable or undesirable.

Note that it is not the intention of the impact assessment to evaluate all potential environmental impacts associated by the Project's environmental aspects, but rather to focus on the potentially **significant** direct and indirect impacts identified during the Scoping phase and any additional issues uncovered during the EIA phase.

The potentially significant environmental impacts associated with the Project, as listed in **Table 32** below, were identified through an appraisal of the following:

- Project-related components and infrastructure (see **Section 9.5 – 9.6**);
- Operation of the PV Plants at the Phase 1 and Phase 2 Sites;
- Activities associated with the project life-cycle (i.e. pre-construction, construction and operation);

- Nature and profile of the receiving environment and potential sensitive environmental features and attributes (see **Section 11**);
- Findings from specialist studies (see **Section 12**);
- Understanding of direct and indirect effects of the Project as a whole (see **Section 13**);
- Comments received during public participation from authorities and IAPs (see **Section 15**); and
- Legal and policy context (see **Section 5**).

Table 32: Potentially Significant Environmental Issues for prioritisation during the EIA Phase

Environmental Factor	Construction Phase Potential Issues / Impacts	Operational Phase Potential Issues / Impacts
Land Use	▪ Permanent change in land use ▪ Risks posed by previous mining activities	▪ Sterilisation of land for future mining or agricultural land uses ▪ Servitude restrictions
Geology	▪ Suitability of geological conditions to support the Solar PV Plant	▪ Suitability of geological conditions to support the Solar PV Plant
Geohydrology	▪ Groundwater pollution due to spillages and poor construction practices ▪ Groundwater use ▪ Influence to groundwater flow	▪ Groundwater pollution due to poor operation and maintenance practices
Topography	▪ Visual impacts ▪ Crossing topographic features (watercourses)	▪ Visual impacts ▪ Crossing topographic features (watercourses)
Soil	▪ Encountering historically contaminated soil ▪ Soil erosion due to clearance and inadequate stormwater management ▪ Soil compaction ▪ Soil contamination due to spillages and poor construction practices ▪ Loss of topsoil	▪ Soil erosion due to inadequate stormwater management ▪ Soil contamination due to poor operation and maintenance practices
Surface Water	▪ Alteration of drainage over sites ▪ Surface water pollution due to spillages and poor construction practices ▪ Encroachment of construction activities into riparian zones / wetlands ▪ Impacts where access roads and ancillary infrastructure cross watercourses (e.g. sedimentation, loss of vegetation, destabilisation of watercourse structure)	▪ Sedimentation through silt-laden runoff, caused by inadequate stormwater management ▪ Damage to the facility from major flood events ▪ Water resources could be contaminated through inadequate storage and handling of hazardous materials, leaks from the BESS and poor management of waste and wastewater ▪ Water use requirements of the Project need to be satisfied
Flora & Fauna	▪ Habitat loss / fragmentation ▪ Potential loss, disturbance or displacement of protected fauna and flora species ▪ Human - animal conflicts ▪ Noise and vibration impacts to fauna ▪ Nights lights may affect nocturnal faunal species	▪ Habitat fragmentation (e.g. barriers to animal movement) ▪ Reflection of sunlight from the solar panels could adversely affect birds, including those species that use the wetlands on the site and surrounding areas ▪ Chemical pollution associated with cleaning the PV panels

Environmental Factor	Construction Phase Potential Issues / Impacts	Operational Phase Potential Issues / Impacts
	▪ Illegal harvesting and poaching of faunal and floral species by construction workers ▪ Pollution of the biophysical environment from poor construction practices ▪ Proliferation of invasive alien species in disturbed areas	▪ Proliferation of invasive alien species in disturbed areas
Socio-economic Environment	▪ Informal use of land to be stopped ▪ People residing on the sites to be relocated ▪ Influx of people seeking employment and associated impacts (e.g. foreign workforce, cultural conflicts, squatting, demographic changes) ▪ Safety and security ▪ Use of local road network ▪ Nuisance from dust and noise ▪ Consideration of local labourers and suppliers in area – stimulation of local economy (positive impact) ▪ Transfer of skills (positive impact)	▪ Direct and indirect economic opportunities as a result of the Project
Air Quality	▪ Dust from the use of dirt roads by construction vehicles ▪ Dust from bare areas that have been cleared for construction purposes ▪ Emissions from construction equipment and machinery ▪ Tailpipe emissions from construction vehicles	▪ Local atmospheric pollution may reduce the irradiation received or contain significant levels of airborne corrosive substances ▪ The efficiency of the solar plant could be reduced if the modules are soiled (covered) by particulates/dust ▪ Impacts to air quality caused by the operation and maintenance of the facility include dust from the use of dirt roads and tailpipe emissions from vehicles
Noise	▪ Localised increases in noise may be caused by construction activities	N/A
Agriculture	▪ Loss of fertile soil through land clearance ▪ Soil erosion ▪ Loss of topsoil ▪ Risk of harm to livestock (associated with informal grazing) from construction activities	▪ Loss of possible future agricultural land use due to direct occupation by the development footprint ▪ Soil erosion due to inadequate stormwater management
Historical and Cultural Features	▪ Possible direct impacts on below-ground archaeological deposits and fossils as a result of ground disturbance ▪ Possible impacts to the cultural landscape as a result of the introduction of incompatible structures and infrastructure to the rural landscape	N/A
Existing Structures & Infrastructure	▪ Rehabilitation measures need to be implemented with regards to the previous mining activities on the sites ▪ Restrictions regarding servitudes of existing infrastructure	▪ Restrictions regarding servitudes of existing infrastructure ▪ Restrictions regarding the vent shaft and sub-station that are to remain on the Phase 1 Site

Environmental Factor	Construction Phase Potential Issues / Impacts	Operational Phase Potential Issues / Impacts
	▪ Restrictions regarding the vent shaft and sub-station that are to remain on the Phase 1 Site	
Transportation	▪ Increase in traffic on the local road network ▪ Transportation of materials and construction personnel to site ▪ Impacts to road conditions ▪ Speeding and reckless driving by construction personnel ▪ Construction vehicles accessing and leaving the sites via provincial roads ▪ Use of oversized vehicles/abnormal loads, as required ▪ Risks to other road users	▪ Transportation of maintenance materials, as well as operational and maintenance personnel, to site
Aesthetics	▪ Landscape transformation ▪ Visual impacts associated with construction activities	▪ Landscape transformation ▪ Light pollution ▪ Glint and glare from facility
Health	▪ Hazards related to previous mining activities ▪ Hazards related to construction work ▪ Increased levels of dust and particulate matter ▪ Increased levels of noise ▪ Water (surface and ground) contamination. ▪ Poor water and sanitation ▪ Communicable diseases ▪ Psychosocial disorder (e.g. social disruptions) ▪ Safety and security ▪ Lack of suitable health services	▪ Hazards related to operation and maintenance work ▪ Fire and explosion risks during BESS operation

The cumulative impacts are discussed in **Section 13.27** below.

The findings of the specialists are of particular importance in terms of understanding the impacts of the Project and managing these during the project life-cycle, as these studies focused on the significant environmental issues identified during the execution of the EIA. As can be seen from the various impact assessments performed by the specialists (see **Section 13** below), there are a host of cross-cutting impacts that are addressed in a number of these studies, with particular reference to the land use, terrestrial ecology and socio-economic effects of the Project. The mitigation measures proposed by the specialists for these similar types of impacts are regarded as complementary and they are aligned with best practices and principles.

13.7 Impact Assessment Methodology

The impacts and the proposed management thereof are first discussed in **Section 13.9** to **Section 13.25** below on a qualitative level and thereafter quantitatively assessed by evaluating the nature, extent, magnitude, duration, probability and ultimately the significance of the impacts (refer to

methodology provided in **Table 33** below). Where applicable, the impact assessments and significance ratings provided by the respective specialists are included.

The assessment considers impacts before and after mitigation, where in the latter instance the residual impact following the application of the mitigation measures is evaluated.

Table 33: Quantitative Impact Assessment Methodology

Nature (/Status)	The project could have the following impacts to the environment: • Positive; • Negative; or • Neutral.
Extent	• Local - extend to the site and its immediate surroundings. • Regional - impact on the region but within the province. • National - impact on an interprovincial scale. • International - impact outside of South Africa.
Magnitude	Degree to which impact may cause irreplaceable loss of resources. • Low - natural and social functions and processes are not affected or minimally affected. • Medium - affected environment is notably altered; natural and social functions and processes continue albeit in a modified way. • High - natural or social functions or processes could be substantially affected or altered to the extent that they could temporarily or permanently cease.
Duration	• Short term - 0-5 years. • Medium term - 5-11 years. • Long term - impact ceases after the operational life cycle of the activity either because of natural processes or by human intervention. • Permanent - mitigation either by natural process or by human intervention will not occur in such a way or in such a time span that the impact can be considered transient.
Probability	• Almost certain - the event is expected to occur in most circumstances. • Likely - the event will probably occur in most circumstances. • Moderate - the event should occur at some time. • Unlikely - the event could occur at some time. • Rare/Remote - the event may occur only in exceptional circumstances.
Significance	Provides an overall impression of an impact's importance, and the degree to which it can be mitigated. The range for significance ratings is as follows- 0 - Impact will not affect the environment. No mitigation necessary. 1 - No impact after mitigation. 2 - Residual impact after mitigation / some loss of populations and habitats of non-threatened species. 3 - Impact cannot be mitigated / exceeds legal or regulatory standard / increases level of risk to public health / extinction of biological species, loss of genetic diversity, rare or endangered species, critical habitat.

In the case of the specialist studies, some of the impact assessment methodologies deviated from the approach shown in **Table 33** above. However, the quantitative basis for these specialist evaluations of the impacts to specific environmental features still satisfied the intention of the EIA.

13.8 Impact Mitigation

13.8.1 Mitigation Hierarchy

Impacts are to be managed by assigning suitable mitigation measures. According to DEAT (2006), the objectives of mitigation are to:

- Find more environmentally sound ways of executing an activity;
- Enhance the environmental benefits of a proposed activity;
- Avoid, minimise or remedy negative impacts; and
- Ensure that residual negative impacts are within acceptable levels.

Mitigation should strive to abide by the following hierarchy – (1) prevent; (2) reduce; (3) rehabilitate (or remediate); and/or (4) compensate for the environmental impacts.

The proposed mitigation of the impacts associated with the Project includes specific measures identified by the technical team (including engineering solutions) and environmental specialists, stipulations of environmental authorities and environmental best practices.

Note that the mitigation measures in the subsequent sections are not intended to be exhaustive, but rather focus on the potentially significant impacts identified.

The EMPr (contained in **Appendix K**) provides a comprehensive list of mitigation measures for specific elements of the Project and the receiving environment, which extends beyond the impacts evaluated in the body of the EIA Report.

13.8.2 EMPr Framework

An EMPr represents a detailed plan of action prepared to ensure that recommendations for enhancing positive impacts and/or limiting or preventing negative environmental impacts are implemented during the life-cycle of a project.

The EMPr aims to satisfy the requirements stipulated in Section 24N of NEMA and Appendix 4 of GN No. R982 (4 December 2014) as amended.

The scope of the Project's EMPr, is as follows:

- Establish management objectives during the project life-cycle in order to enhance benefits and minimise adverse environmental impacts;
- Provide targets for management objectives, in terms of desired performance;
- Describe actions required to achieve management objectives;
- Outline institutional structures and roles required to implement the EMPr;
- Provide legislative framework; and
- Describe the requirements for record keeping, reporting, review, auditing and updating of the EMPr.

All liability for the implementation of the EMPr (as well as the EIA findings and Environmental Authorisation, if granted) lies with the Project Proponent.

The following considerations and assumptions accompany the compilation of the EMPr:

- The EMPr is guided by the following principles, based on Lochner (2005) -
  - **Continuous improvement -** The Project Proponent should be committed to review and to continually improve environmental management, with the objective of improving overall environmental performance;
  - **Broad level of commitment -** A broad level of commitment is required from all levels of management as well as the workforce in order for the implementation of the EMPr to be successful and effective; and
  - **Flexible and responsive -** The implementation of the EMPr needs to be responsive to new and changing circumstances. The EMPr report is a dynamic "living" document that will need to be updated regularly throughout the duration of the project life-cycle.
- Compliance with the EMPr must be audited in terms of Regulation 34 of GN No. R 982 of 4 December 2014 (as amended).
- The EMPr provides the framework for the overarching environmental management requirements for the project life-cycle. Following detailed design and planning, the EMPr may need to be revised to render the management actions more explicit and accurate to the final project specifications.
- Any amendments to the EMPr must be undertaken in accordance with Regulations 35 – 37 of GN No. R. 982 of 4 December 2014 (as amended).
- The EMPr will be linked to the project's overall Environmental Management System (EMS) (if applicable), where the EMS constitutes an iterative process that aims achieve continuous improvement and enhanced environmental performance.
- Although every effort has been made to ensure that the scope and level of detail of the EMPr are tailored to the level of environmental risk (i.e. type and scale of activity and the sensitivity of the affected environment) and the project- and site-specific conditions, certain of the environmental management requirements within the EMPr may be regarded as generic to make provision for activities that may take place as part of the overall Project.

13.9 Land Use

13.9.1 Impact Description

Certain informal uses of the sites earmarked for the PV Plants are taking place, including the grazing of livestock, informal settling and people residing within the old mine houses. The MLM, as the landowner, is responsible for the removal of informal dwellings and illegal dumping areas on the sites, as well as for relocating the people residing in the old mine houses.

Both of the Phase 1 and Phase 2 Sites are located on land that was previously used for mining purposes. An application in terms of Section 53 of the MPRDA was submitted to the DMRE by the Applicant. In response, the DMRE stated that due to the fact that the Applicant reached an agreement and submitted a consent letter from the mining company, no objection is raised against the proposed Project.

Structures and infrastructure related to the previous mining activities are present on the Phase 1 and Phase 2 Sites. Of these, the vent shaft and sub-station at the Phase 1 Site are still operational and will remain. The previous mining company (i.e. Harmony Gold Mining Company Ltd) is responsible for all the surface disturbances on the mining areas which includes, all historical mining and prospecting activities. The Radiological Survey found that radioactive tailings are still present on the PV Sites. These sites will not be released from NNR regulatory control until these tailings have been removed or used in an approved manner (SciRAD Consulting, 2020).

13.9.2 Impact Assessment

Environmental Feature	**Land Use**
Relevant Alternatives & Activities	**All physical infrastructure and ancillary structures that form part of the Project**
Project life-cycle	**Construction & operational phases**
Potential Aspects & Impacts	**Proposed Management Objectives / Mitigation Measures**
• Impacts on current informal use of land • Impacts of old mining activities, structures and infrastructure on the development of the PV Sites	• Scheduling and implementation of rehabilitation activities in accordance with the Tripartite and Rehabilitation Agreement between the Mining Company, MLM and the Applicant. • Allow for safe access to and operation of the vent shaft and sub-station at Phase 1 Site. These areas are excluded from the layout. • Exclude tailings storage facilities to the south of the Phase 1 Site and the north of the Phase 2 Site from the development. • Implement recommendations from the Radiological Survey (SciRAD Consulting, 2020) in terms of the tailings material. Undertake a follow-up survey to verify that the activity concentrations in the respective areas are below 0.5 Bq/g. • Receive approval from the NNR for the development of the sites.

	+/- Impacts	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**
Before Mitigation	-	local	medium-high	short-term	almost certain	3
After Mitigation	-	local	low	short-term	moderate	1

13.10 Soils

13.10.1 Impact Description

According to Index (2020), soils that are highly prone to wind erosion are encountered as the PV Sites. During the construction phase large areas will be cleared of vegetation, which may lead to

soil erosion. Erosion could also take place in the absence of suitable stormwater management. The EMPr includes suitable storm water management measures to prevent the occurrence of erosion.

Considering the previous mining activities that took place on the PV Sites, there is a likelihood of encountering historically contaminated soil. Soil may also be polluted by poor storage or handling of material, spillages and inadequate housekeeping practices. Specific mitigation measures are contained in the EMPr, where the primary objective is the effective and safe management of materials on site, in order to minimise the impact of these materials on the biophysical environment. The same objective applies to the correct management and handling of hazardous substances (e.g. fuel, transformer oil, batteries).

13.10.2 Impact Assessment

Environmental Feature	**Soils**
Relevant Alternatives & Activities	**Construction and operational activities**
Project life-cycle	**Construction & operational phases**
Potential Aspects & Impacts	**Proposed Management Objectives / Mitigation Measures**
• Soil erosion • Soil compaction	• Consider findings from geotechnical investigations during Project design phase and incorporate mitigation measures (as relevant). • Take representative soil samples to determine existing levels of soil contamination. Manage soil and spoil material accordingly. • Stabilisation of cleared areas and watercourse crossings to prevent and control erosion. • Manage drainage from sites to minimise erosion. • Reinstate and rehabilitate disturbed areas to prevent future erosion. • See mitigation measures regarding hazardous substances & waste • Rehabilitation of construction footprint.

	+/- Impacts	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**
Before Mitigation	-	local	medium-high	short-term	likely	3
After Mitigation	-	local	low	short-term	unlikely	1

13.11 Geohydrology

13.11.1 Impact Description

Groundwater may be impacted by the Project as follows:

- Possible influence on groundwater flow as a result of trenching and building of infrastructure and structures associated with the development footprint during construction.
- Use of groundwater during construction and operational phases; and
- Potential contamination of groundwater during construction and operational phases as a result of inadequate management of wastewater and spillages of dangerous goods.

13.11.2 Impact Assessment

Environmental Feature	Geohydrology
Relevant Alternatives & Activities	**Construction and operational activities**
Project life-cycle	**Construction & operational phases**
Potential Aspects & Impacts	**Proposed Management Objectives / Mitigation Measures**
• Groundwater pollution • Groundwater use • Impacts to groundwater flow	• Consider findings from geotechnical investigations during Project design phase and incorporate mitigation measures (as relevant). • Suitable protection of groundwater during excavations. • All storage tanks containing hazardous materials must be placed in bunded containment areas with impermeable surfaces. The bunded area must be able to contain 110% of the total volume of the stored hazardous material. • Provide sufficient and suitable sanitation facilities during construction and operational phases, which shall conform to all relevant health and safety standards and codes. • Reduce sediment loads in water from dewatering operations. All dewatering should be done through temporary sediment traps (e.g. constructed out of geo-textiles and hay bales). • The intention is for water to be supplied by the MLM, with water connections to the Phase 1 and Phase 2 Sites. If any groundwater is to be used during the construction and operational phases, it will need to comply with the provisions of the NWA.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	-	local	medium-high	long-term	likely	3
After Mitigation	-	local	low	long-term	unlikely	1

13.12 Surface Water

13.12.1 Hydrology (Flood Management)

Key hydrological features associated with the PV Sites include the following:

- The Mahemspruit (south-west of Phase 1 Site), Sandspruit (north-east of Phase 2 Site) and a non-perennial river (west of Phase 2 Site) are the most prominent rivers in the area; and
- Based on a combination of desktop and in-field delineations, a total of 29 and 9 individual natural wetland HGM units were identified and delineated for the Phase 1 and Phase 2 Sites, respectively.

Potential impacts in terms of the movement of water over the Phase 1 and Phase 2 Sites include the following:

- The development may alter the drainage on the PV Sites and may cause an increase in runoff;
- Impacts where access roads and ancillary infrastructure cross watercourses;
- Impacts caused by inadequate stormwater management at the PV Sites; and
- Damage to the development from major flood events.

13.12.2 Impact Assessment

Environmental Feature	**Hydrology**
Relevant Alternatives & Activities	**Construction and operational activities**
Project life-cycle	**Construction & operational phases**
Potential Aspects & Impacts	**Proposed Management Objectives / Mitigation Measures**
• Alteration of drainage over sites • Watercourse crossings • Inadequate stormwater management • Damage caused by floods	• Structures associated with the PV facilities are to be developed outside of the 1:100 year floodline of any watercourse. • Design and implement a suitable stormwater drainage system on the PV Sites. • Identify appropriate protection measures during the design stage, taking into consideration foundation stability, access road stability, and electrical connections (amongst others). • Erosion protection measures to be installed where there are possibilities of surface water sheet flow causing erosion. • The construction camp shall not be situated within 100 meters or within the 1:100 year flood line of any watercourse. • Stabilisation of watercourses at crossings (access roads and ancillary infrastructure). • Carry out earthworks in phases across PV Sites to reduce the total area of disturbed ground at any one time.

	+/- Impacts	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**
Before Mitigation	-	local	medium-high	long-term	likely	2
After Mitigation	-	local	low	long-term	unlikely	1

13.12.3 Wetlands

The findings from the Water Resources Impact Assessment (contained in **Appendix H1**) follow.

13.12.3.1 Impact Description

The risk area for the Phase 1 and Phase 2 Sites are presented in **Figure 99** and **Figure 100** below, respectively. High risk areas are associated with wetlands that will be directly impacted on by the proposed development. Medium risk refers to wetland areas that are either on the periphery of the infrastructure and at an indirect risk, or wetland areas that could be avoided if feasible. Low risk areas are wetland systems beyond the Project area that would be avoided. The high and medium risk areas were the priority for the risk assessment, focussing on the expected loss of wetland areas and the potential indirect risks. As a result of the likely loss of wetland areas, all aspects considered for the risk assessment pose a Moderate level of risk. The loss of wetland areas cannot be effectively mitigated, and in accordance with the mitigation hierarchy some form of compensation would be required.

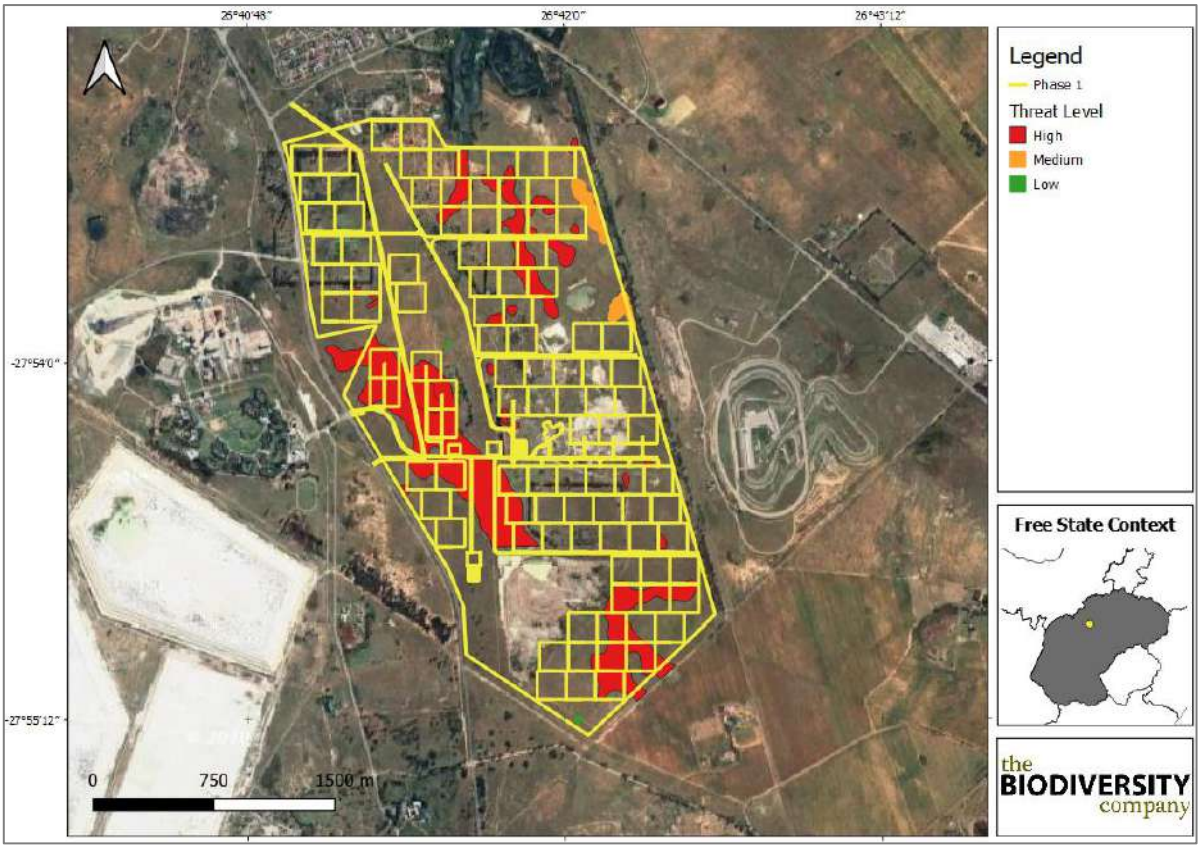


Figure 99: EIS, (A) numbers and (B) area of wetlands classified under each of the four EIS classes at the Phase 1 Site (TBC, 2020a)

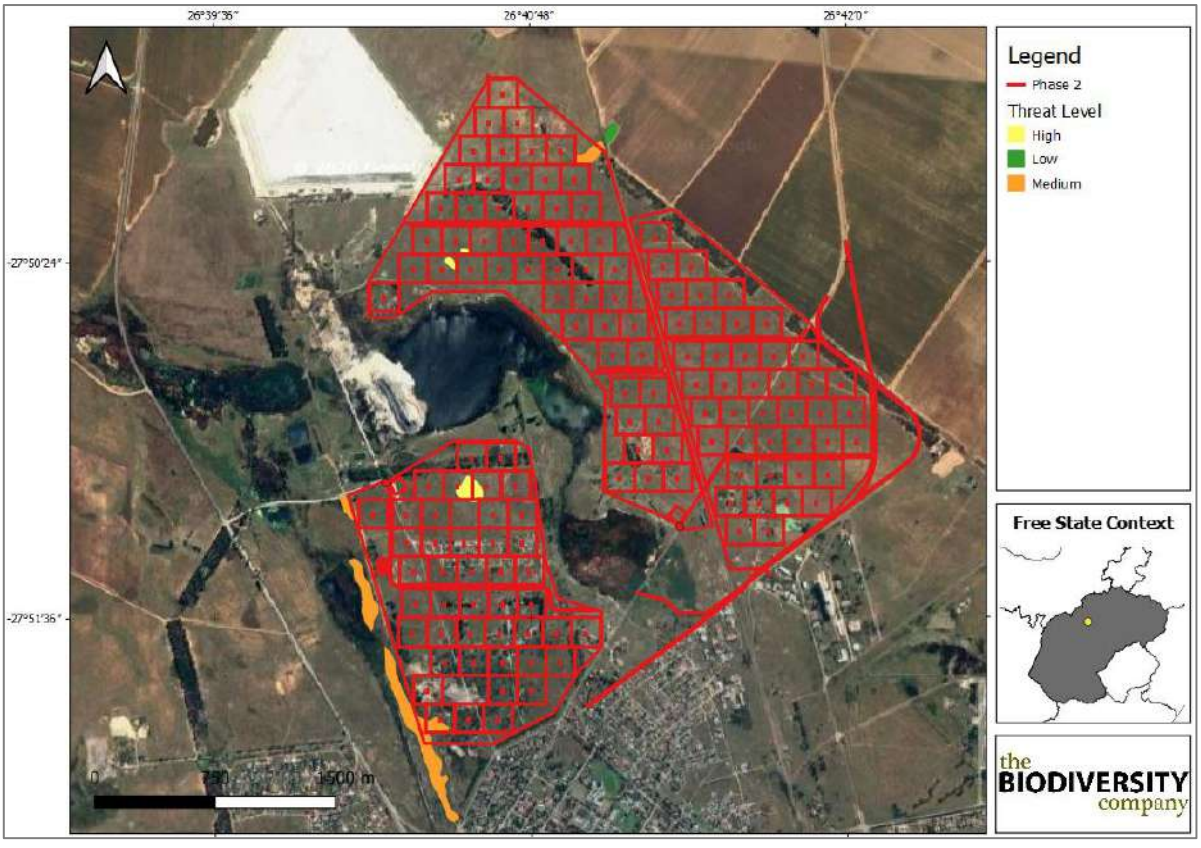


Figure 100: EIS, (A) numbers and (B) area of wetlands classified under each of the four EIS classes at the Phase 2 Site (TBC, 2020a)

13.12.3.2 Impact Assessment

Table 34: DWS Risk Impact Matrix for the proposed Project (Andrew Husted Pr Sci Nat 400213/11) (TBC, 2020a)

Activity	Aspect	Impact	Mitigation	Severity					Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Significance	Risk Rating	Control Measures
				Flow Regime	Water Quality	Habitat	Biota	Total											
Construction																			
Site clearing and preparation.	Wetland disturbance / loss.	Direct disturbance / degradation / loss to wetland soils or vegetation due to the construction of the solar facility.	Without	5	4	5	4	4.5	3	3	11	4	5	5	1	15	158	**M**	• Clearly demarcate the construction footprint and restrict all construction activities to within the proposed infrastructure area. • Clear vegetation in line with the 2010 Eskom Environmental Procedure Document entitled "Procedure for vegetation clearance and maintenance within overhead powerline servitudes". • Minimize the disturbance footprint and the unnecessary clearing of vegetation outside of this area. • Use the wetland shapefiles to signpost the edge of the wetlands closest to site. Place the sign 25 m from the edge (this is the buffer zone). Label these areas as environmentally sensitive areas, keep out. • Educate staff and relevant contractors on the location and importance of the identified wetlands through toolbox talks and by including them in site inductions as well as the overall master plan. • All activities (including driving) must remain at least 20 m outside of the edge of all the wetlands identified on site that will be conserved. • Promptly remove / control all alien and invasive plant species that may emerge during construction (i.e. weedy annuals and other alien forbs) must be removed. • In line with the 2010 Eskom Environmental Procedure Document entitled "*Procedure for vegetation clearance and maintenance within overhead*
			With	4	4	4	4	4	3	3	10	4	4	5	1	14	140	**M**	

Activity	Aspect	Impact	Mitigation	Severity					Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Significance	Risk Rating	Control Measures
				Flow Regime	Water Quality	Habitat	Biota	Total											
																			powerline servitudes" all alien vegetation along the transmission servitude should be managed in terms of the Regulation GNR.1048 of 25 May 1984 (as amended) issued in terms of the Conservation of Agricultural Resources Act, Act 43 of 1983. • Clearly demarcate construction footprint and limit all activities to within this area. • Minimize unnecessary clearing of vegetation. • Landscape and re-vegetate all denuded areas as soon as possible.
	Water runoff from construction site.	Increased erosion and sedimentation.	Without	4	4	3	3	3.5	3	3	9.5	4	4	5	2	15	143	**M**	• Limit construction activities to winter (as much as possible) when rain is least likely to wash concrete and sand into the wetland (relevant to construction activities close to wetlands / buffers). Activities in vertic (turf) soils can become messy during the height of the rainy season and construction activities should be minimised during these times to minimise unnecessary soil disturbances. This limitation must be prioritised for activities in or near wetland areas. • Ensure soil stockpiles and concrete / building sand are sufficiently safeguarded against rain wash. • Do not situate any of the construction material laydown areas within any wetland that will be conserved. • No machinery should be allowed to park in any wetlands that will be conserved. • Landscape and re-vegetate all unnecessarily denuded areas as soon as possible.
			With	3	3	2	2	2.5	3	2	7.5	4	3	2	1	10	75	**M**	

Activity	Aspect	Impact	Mitigation	Severity					Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Significance	Risk Rating	Control Measures
				Flow Regime	Water Quality	Habitat	Biota	Total											
		Potential contamination of wetlands with machine oils and construction materials.	Without	2	4	3	3	3	2	2	7	4	4	5	2	15	105	M	• Make sure all excess consumables and building materials / rubble is removed from site and deposited at an appropriate waste facility. • Appropriately stockpile topsoil cleared from the project area. • Appropriately contain any generator diesel storage tanks, machinery spills (e.g. accidental spills of hydrocarbons oils, diesel etc.) or construction materials on site (e.g. concrete) in such a way as to prevent them leaking and entering the wetlands. • Do not store any construction materials or equipment within any of the identified wetlands or their buffers. • Mixing of concrete must under no circumstances take place within any wetland.
			With	2	2	2	2	2	2	2	6	2	3	5	2	12	72	M	
Operation																			
Operation of the solar facility.	Hardened surfaces.	Potential for increased stormwater runoff leading to Increased erosion and sedimentation.	Without	3	3	3	3	3	4	2	9	4	4	5	2	15	135	M	• Design and Implement an effective stormwater management plan. • Promote water infiltration into the ground beneath the solar panels. • Release only clean water into the environment. • Stormwater leaving the site should not be concentrated in a single exit drain but spread across multiple drains around the site each fitted with energy dissipaters (e.g. slabs of concrete with rocks cemented in). • Re-vegetate denuded areas as soon as possible. • Regularly clear drains. • Minimise the extent of concreted / paved / gravel areas. • A covering of soil and grass (regularly cut and maintained) below the solar panels is ideal for infiltration. If not feasible then
			With	2	2	2	2	2	3	2	7	2	3	5	1	11	77	M	

Activity	Aspect	Impact	Mitigation	Severity					Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Significance	Risk Rating	Control Measures
				Flow Regime	Water Quality	Habitat	Biota	Total											
																			gravel is preferable over concrete or paving. • Avoid excessively compacting the ground beneath the solar panels.
	Contamination.	Potential for increased contaminants entering the wetland systems.	Without	2	4	3	3	3	4	2	9	4	4	5	2	15	135	**M**	• Where possible minimise the use surfactants to clean solar panels and herbicides to control vegetation beneath the panels. If surfactants and herbicides must be used do so well prior to any significant predicted rainfall events.
			With	2	2	2	2	2	3	2	7	2	3	5	1	11	77	**M**	
Closure																			
Decommissioning of the solar facility.	Rehabilitation.	Potential loss or degradation of nearby wetlands through inappropriate closure.	Without	3	3	4	3	3.3	3	3	9.3	4	4	5	1	14	130	**M**	• Develop and implement a rehabilitation and closure plan. • Appropriately rehabilitate the project area by ripping, landscaping and re-vegetating with locally indigenous species.
			With	2	2	2	2	2	3	2	7	3	3	1	1	8	56	**M**	

13.13 Terrestrial Ecology

The findings from the Terrestrial Ecological Impact Assessment (contained in **Appendix H2**) follow.

13.13.1 Impact Description

In terms of terrestrial habitats, areas that were classified as having a low-moderate sensitivity included those areas which were deemed by the Specialist to have been impacted upon and/or were disturbed from their original condition due to historic and recent impacts associated the anthropogenic presence throughout. Areas with a high sensitivity were the wetland habitats (including waterlogged area at the Phase 2 Site).

The main anticipated impacts during the construction phase include the following:

- Destruction, fragmentation and degradation of habitats and ecosystems;
- Spread and/or establishment of alien and/or invasive species;
- Displacement of faunal community (including several SCC) due to habitat loss, direct mortalities and disturbance (road collisions, noise, light, dust, vibration);
- Mortalities and displacements of fauna and flora SCCs; and
- Chemical pollution associated with dust suppressants.

The main anticipated impacts during the operational phase include the following:

- Continued fragmentation and degradation of habitats, ecosystems and CBA2 areas;
- Spread of alien and/or invasive species;
- Displacement and direct mortalities of faunal community (including SCC) due to disturbance (road collisions, collisions with BESS and substation, noise, light, dust, vibration);
- Reduced dispersal/migration of fauna;
- Chemical pollution associated with measures to keep PV clean; and
- Fencing of PV site.

13.13.2 Impact Assessment

Table 35: Assessment of significance of potential impacts on terrestrial ecology associated with the construction phase of Phase 1 (TBC, 2020b)

Impact	Prior to mitigation						Post mitigation					
	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
Destruction, fragmentation and degradation of habitats, and ecosystems	5	3	4	4	5		4	2	3	4	4	
	Permanent	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Great / harmful/ ecosystem structure and function largely altered	Ecology highly sensitive /important	Definite	**High**	Life of operation or less than 20 years: Long Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Significant / ecosystem structure and function moderately altered	Ecology highly sensitive /important	Highly likely	**Moderate**
Spread and/or establishment of alien and/or invasive species	4	3	3	4	4		3	2	2	2	3	
	Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Significant / ecosystem structure and function moderately altered	Ecology highly sensitive /important	Highly likely	**Moderately High**	One year to five years: Medium Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Likely	**Low**
Displacement of faunal community (Including several SCC) due to habitat loss, direct mortalities and disturbance (road	3	3	3	3	3		2	2	2	2	3	
	One year to five years: Medium Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear	Significant / ecosystem structure and function moderately altered	Ecology moderately sensitive/ /important	Likely	**Moderate**	One month to one year: Short Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Likely	**Low**

Impact	Prior to mitigation						Post mitigation					
	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
collisions, noise, light, dust, vibration);		features affected < 1000m						affected < 100m				
Mortalities and displacements of fauna and flora SCCs.	3	3	3	4	4		2	2	2	4	3	
	One year to five years: Medium Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Significant / ecosystem structure and function moderately altered	Ecology highly sensitive /important	Highly likely	**Moderate**	One month to one year: Short Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology highly sensitive /important	Likely	**Low**
Chemical pollution associated with dust suppressants	3	4	4	3	3		2	2	2	2	1	
	One year to five years: Medium Term	Regional within 5 km of the site boundary / < 2000ha impacted / Linear features affected < 3000m	Great / harmful/ ecosystem structure and function largely altered	Ecology moderately sensitive/ /important	Likely	**Moderate**	One month to one year: Short Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Highly unlikely	**Absent**

Table 36: Assessment of significance of potential impacts on terrestrial ecology associated with the construction phase of Phase 2 (TBC, 2020b)

Impact	Prior to mitigation						Post mitigation					
	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
Destruction, fragmentation and degradation of habitats and ecosystems	5	3	4	3	5		4	2	3	4	4	
	Permanent	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Great / harmful/ ecosystem structure and function largely altered	Ecology moderately sensitive/ /important	Definite	**Moderately High**	Life of operation or less than 20 years: Long Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Significant / ecosystem structure and function moderately altered	Ecology highly sensitive /important	Highly likely	**Moderate**
Spread and/or establishment of alien and/or invasive species	4	3	3	3	4		3	2	2	2	3	
	Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Significant / ecosystem structure and function moderately altered	Ecology moderately sensitive/ /important	Highly likely	**Moderate**	One year to five years: Medium Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Likely	**Low**
Displacement of faunal community (Including several SCC) due to habitat loss, direct mortalities and disturbance (road collisions, noise, light,	3	3	3	3	4		2	2	2	2	3	
	One year to five years: Medium Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Significant / ecosystem structure and function moderately altered	Ecology moderately sensitive/ /important	Highly likely	**Moderate**	One month to one year: Short Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Likely	**Low**

Impact	Prior to mitigation						Post mitigation					
	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
dust, vibration);												
Mortalities and displacements of fauna and flora SCCs.	3	3	3	3	4		2	2	2	2	3	
	One year to five years: Medium Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Significant / ecosystem structure and function moderately altered	Ecology moderately sensitive/ /important	Highly likely	**Moderate**	One month to one year: Short Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Likely	**Low**
Chemical pollution associated with dust suppressants	3	4	3	3	3		2	2	2	2	3	
	One year to five years: Medium Term	Regional within 5 km of the site boundary / < 2000ha impacted / Linear features affected < 3000m	Significant / ecosystem structure and function moderately altered	Ecology moderately sensitive/ /important	Likely	**Moderate**	One month to one year: Short Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Likely	**Low**

Table 37: Assessment of significance of potential impacts on terrestrial ecology associated with the operational phase of Phase 1 (TBC, 2020b)

Impact	Prior to mitigation						Post mitigation					
	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
Continued fragmentation and degradation of habitats and ecosystems	5	4	4	4	4		4	3	3	3	3	
	Permanent	Regional within 5 km of the site boundary / < 2000ha impacted / Linear features affected < 3000m	Great / harmful/ ecosystem structure and function largely altered	Ecology highly sensitive /important	Highly likely	**High**	Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Significant / ecosystem structure and function moderately altered	Ecology moderately sensitive/ /important	Likely	**Moderate**
Spread and/or establishment of alien and/or invasive species	4	3	3	4	4		2	2	2	2	3	
	Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Significant / ecosystem structure and function moderately altered	Ecology highly sensitive /important	Highly likely	**Moderately High**	One month to one year: Short Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Likely	**Low**
Displacement and direct mortalities of faunal community (including SCC) due to disturbance (road collisions, collisions with substation, noise, light,	4	3	3	3	3		3	2	2	2	2	
	Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Significant / ecosystem structure and function moderately altered	Ecology moderately sensitive/ /important	Likely	**Moderate**	One year to five years: Medium Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Possible	**Low**

Impact	Prior to mitigation						Post mitigation					
	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
dust, vibration)												
Reduced dispersal of fauna	4	3	3	4	3		2	2	2	2	3	
	Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Significant / ecosystem structure and function moderately altered	Ecology highly sensitive /important	Likely	**Moderate**	One month to one year: Short Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Likely	**Low**
Chemical pollution associated with measures to keep PV clean	4	3	3	4	3		2	2	2	2	3	
	Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Significant / ecosystem structure and function moderately altered	Ecology highly sensitive /important	Likely	**Moderate**	One month to one year: Short Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Likely	**Low**
Fencing of PV site	4	3	3	4	3		2	2	2	2	3	
	Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features	Significant / ecosystem structure and function moderately altered	Ecology highly sensitive /important	Likely	**Moderate**	One month to one year: Short Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Likely	**Low**

Impact	Prior to mitigation						Post mitigation					
	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
		affected < 1000m										

Table 38: Assessment of significance of potential impacts on terrestrial ecology associated with the operational phase of Phase 2 (TBC, 2020b)

Impact	Prior to mitigation						Post mitigation					
	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
Continued fragmentation and degradation of habitats and ecosystems	5	4	4	3	4		4	3	3	3	3	
	Permanent	Regional within 5 km of the site boundary / < 2000ha impacted / Linear features affected < 3000m	Great / harmful/ ecosystem structure and function largely altered	Ecology moderately sensitive/ /important	Highly likely	**High**	Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Significant / ecosystem structure and function moderately altered	Ecology moderately sensitive/ /important	Likely	**Moderate**
Spread and/or establishment of alien and/or invasive species	4	3	3	3	4		2	2	2	2	3	
	Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Significant / ecosystem structure and function moderately altered	Ecology moderately sensitive/ /important	Highly likely	**Moderate**	One month to one year: Short Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Likely	**Low**
	4	4	3	3	3		3	2	2	2	2	

Impact	Prior to mitigation						Post mitigation					
	Duration of Impact	**Spatial Scope**	**Severity of Impact**	**Sensitivity of Receiving Environment**	**Probability of Impact**	**Significance**	**Duration of Impact**	**Spatial Scope**	**Severity of Impact**	**Sensitivity of Receiving Environment**	**Probability of Impact**	**Significance**
Displacement and direct mortalities of faunal community (including SCC) due to disturbance (road collisions, collisions with substation, noise, light, dust, vibration)	Life of operation or less than 20 years: Long Term	Regional within 5 km of the site boundary / < 2000ha impacted / Linear features affected < 3000m	Significant / ecosystem structure and function moderately altered	Ecology moderately sensitive/ /important	Likely	**Moderate**	One year to five years: Medium Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Possible	**Low**
Reduced dispersal of fauna	4	3	4	3	3		2	2	2	2	3	
	Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Great / harmful/ ecosystem structure and function largely altered	Ecology moderately sensitive/ /important	Likely	**Moderate**	One month to one year: Short Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Likely	**Low**
Chemical pollution associated with measures to keep PV clean	4	3	4	3	3		2	2	2	2	3	
	Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features	Great / harmful/ ecosystem structure and function largely altered	Ecology moderately sensitive/ /important	Likely	**Moderate**	One month to one year: Short Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Likely	**Low**

Impact	Prior to mitigation						Post mitigation					
	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
		affected < 1000m										
Fencing of PV site	4	3	4	3	3		2	2	2	2	3	
	Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Great / harmful/ ecosystem structure and function largely altered	Ecology moderately sensitive/ /important	Likely	**Moderate**	One month to one year: Short Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Likely	**Low**

Table 39: Mitigation Measures – terrestrial ecology (TBC, 2020b)

Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
Management outcome: Vegetation and Habitats				
Areas rated as High sensitivity in proximity to the development areas, should be declared as 'no-go' areas during the construction phase and operational phase, and all efforts must be made to prevent access to this area from construction workers, machinery. The infrastructure should be realigned to prioritise development within low/moderate sensitivity areas. This excludes High sensitivity areas which are authorised for development.	Life of operation	Project manager, Environmental Officer	Development footprint	Ongoing
Areas of indigenous vegetation, even secondary communities outside of the direct project footprint, should under no circumstances be fragmented or disturbed further. Clearing of vegetation should be minimized and avoided where possible.	Life of operation	Project manager, Environmental Officer	Areas of indigenous vegetation	Ongoing
Where possible, existing access routes and walking paths must be made use of.	Construction/Operational Phase	Environmental Officer & Design Engineer	Roads and paths used	Ongoing
All laydown, chemical toilets etc. should be restricted to low sensitivity areas. Any materials may not be stored for extended periods of time and must be removed from the project area once the construction/closure phase has	Construction/Operational Phase	Environmental Officer & Design Engineer	Laydown areas	Ongoing

Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
been concluded. No storage of vehicles or equipment will be allowed outside of the designated project areas.				
Areas that are denuded during construction need to be re-vegetated with indigenous vegetation to prevent erosion during flood and wind events. This will also reduce the likelihood of encroachment by alien invasive plant species.	Operational phase	Environmental Officer & Contractor	Assess the state of rehabilitation and encroachment of alien vegetation	Quarterly for up to two years after the closure
Any woody material removed can be shredded and used in conjunction with the topsoil to augment soil moisture and prevent further erosion.	Operational and Decommissioning phase	Environmental Officer & Contractor	Woody material around footprint	During Phase
A spill management plan must be put in place to ensure that should there be any chemical spill out or over that it does not run into the surrounding areas. The Contractor shall be in possession of an emergency spill kit that must always be complete and available on site. Drip trays or any form of oil absorbent material must be placed underneath vehicles/machinery and equipment when not in use. No servicing of equipment on site unless necessary. All contaminated soil / yard stone shall be treated *in situ* or removed and be placed in containers. Appropriately contain any generator diesel storage tanks, machinery spills (e.g. accidental spills of hydrocarbons oils, diesel etc.) in such a way as to prevent them leaking and entering the environment.	Life of operation	Environmental Officer & Contractor	Spill events, Vehicles dripping.	Ongoing
Storm Water run-off & Discharge Water Quality	Life of operation	Environmental Officer & Design Engineer	Water Quality and presence of erosion	Ongoing
It should be made an offence for any staff to take/ bring any plant species into/out of any portion of the project area. No plant species whether indigenous or exotic should be brought into/taken from the project area, to prevent the spread of exotic or invasive species or the illegal collection of plants.	Life of operation	Project manager, Environmental Officer	Any instances	Ongoing
A fire management plan needs to be complied and implemented to restrict the impact fire might have on the surrounding areas.	Life of operation	Environmental Officer & Contractor	Fire Management	During Phase
Rocks removed in the construction phased may not be dumped, but can be used in areas where erosion control needs to be performed	Operational phase	Environmental Officer & Contractor	Rock piles	During Phase
Any individual of the nationally protected trees or protected plants that was observed needs a relocation or destruction permit in order for any individual that may be removed or destroyed due to the development. Preferably, the trees/plants can be relocated within the property without a permit or otherwise left unharmed. Hi visibility flags must be placed near any protected plants in order to avoid any damage or destruction of the species. If left undisturbed the sensitivity and importance of these species needs to be part of the environmental awareness program.	Life of operation	Project manager, Environmental Officer Lodge Manager	Protected Tree/Plant species	Ongoing
The BESS surfaces may not have reflective surfaces which can lead to veld fires	Operational phase	Environmental Officer & Contractor	Fire Management	During Phase
Management outcome: Fauna				
The areas to be developed must be specifically demarcated to prevent movement of staff or any individual into the surrounding environments. Signs must be put up to enforce this.	Construction/Operational Phase	Project manager, Environmental Officer	Infringement into these areas	Ongoing

Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
Noise must be kept to an absolute minimum during the evenings and at night to minimize all possible disturbances to amphibian species and nocturnal mammals.	Construction/Operational Phase	Environmental Officer	Noise levels	Ongoing
No trapping, killing, or poisoning of any wildlife is to be allowed. Signs must be put up to enforce this.	Life of operation	Environmental Officer	Evidence of trapping etc	Ongoing
Try incorporating motion detection lights as much as possible to reduce the duration of illumination. Heights of light columns to be minimised to reduce light spill. Baffles, hoods or louvres to also be used to reduce light spill.	Construction Phase	Environmental Officer & Design Engineer	Light pollution	Ongoing
Outside lighting should be designed and limited to minimize impacts on fauna. All outside lighting should be directed away from highly sensitive areas. Fluorescent and mercury vapor lighting should be avoided and sodium vapor (green/red) lights should be used wherever possible.	Construction/Operational Phase	Project manager, Environmental Officer & Design Engineer	Light pollution and period of light.	Ongoing
All construction and maintenance motor vehicle operators should undergo an environmental induction that includes instruction on the need to comply with speed limits, to respect all forms of wildlife. Speed limits must still be enforced to ensure that road killings and erosion is limited.	Life of operation	Health and Safety Officer	Compliance to the training.	Ongoing
Schedule activities and operations related to the construction phase during least sensitive periods, to avoid migration, nesting and breeding seasons. This refers to high and very high sensitivity areas / habitat.	Life of operation	Project manager, Environmental Officer & Design Engineer	Activities should take place during the day in the case.	Ongoing
Heat generated from the substations must be monitored to ensure it does not negatively affect the local fauna.	Life of operation	Environmental Officer & Contractor	Heat generated by substations	Ongoing
All areas to be developed must be walked through prior to any activity to ensure no nests or fauna species are found in the area. Should any SCC not move out of the area or their nest be found in the area a suitably qualified specialist must be consulted to advise on the correct actions to be taken.	Construction and Operational phase	Project manager, Environmental Officer	Presence of Nests and faunal species	Planning, Construction and Decommissioning
Any holes/deep excavations must be dug and planted in a progressive manner. Should the holes overnight they must be covered temporarily to ensure no small fauna species fall in.	Planning and construction	Environmental Officer & Contractor, Engineer	Presence of trapped animals and open holes	Ongoing
Ensure that cables and connections are insulated successfully to reduce electrocution risk.	Planning and construction	Environmental Officer & Contractor, Engineer	Presence of electrocuted fauna	Ongoing
Small holes (30cm by 30cm) must be placed in the fence along the wetland areas and stream areas to allow animals to move between the areas, the holes must not be placed in the fence where it is next to a major road as this will increase road killings in the area.	Planning and construction	Environmental Officer & Contractor, Engineer	Fauna movement corridor	Ongoing
Use environmentally friendly cleaning and dust suppressant products.	Construction and operation	Environmental Officer & Contractor, Engineer	Presence of chemicals in and around the project area	Ongoing
Fencing mitigations: • Top 2 strands must be smooth wire. • Routinely retention loose wires. • Minimum 30cm between wires. • Place markers on fences.	Planning, construction and operation	Environmental Officer & Contractor, Engineer	Monitor fences for slack wires	Ongoing
Any exposed parts must be covered (insulated) to reduce electrocution risk.	Planning and construction	Environmental Officer & Contractor, Engineer	Presence of electrocuted fauna	Ongoing

Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
Management outcome: Alien species				
The footprint area of the construction should be kept to a minimum. The footprint area must be clearly demarcated to avoid unnecessary disturbances to adjacent areas. Footprint of the roads must be kept to prescribed widths.	Construction/Operational Phase	Project manager, Environmental Officer & Contractor	Footprint Area	Life of operation
An alien management plan must be implemented quarterly for 2 years after phase.	Construction phase and Decommissioning phase	Project manager, Environmental Officer & Contractor	Assess presence and encroachment of alien vegetation	Quarterly for 2 years after phase
Management outcome: Dust				
Dust-reducing mitigation measures must be put in place and must be strictly adhered to. This includes wetting of exposed soft soil surfaces. No non environmentally friendly suppressants may be used as this could result in pollution of water sources.	Life of operation	Contractor	Dustfall	Dust monitoring program.
Management outcome: Waste management				
Waste management must be a priority and all waste must be collected and stored effectively.	Life of operation	Environmental Officer & Contractor	Waste Removal	Weekly
Manage litter, spills, fuels, chemicals and human waste in and around the project area.	Construction/Closure Phase	Environmental Officer & Health and Safety Officer	Presence of Waste	Daily
A minimum of one toilet must be provided per 10 persons. Portable toilets must be pumped dry to ensure the system does not degrade over time and spill into the surrounding area.	Life of operation	Environmental Officer & Health and Safety Officer	Number of toilets per staff member. Waste levels	Daily
The Contractor should supply sealable and properly marked domestic waste collection bins and all solid waste collected shall be disposed of at a licensed disposal facility.	Life of operation	Environmental Officer & Health and Safety Officer	Availability of bins and the collection of the waste.	Ongoing
Where a registered disposal facility is not available close to the project area, the Contractor shall provide a method statement with regard to waste management. Under no circumstances may domestic waste be burned on site.	Life of operation	Environmental Officer, Contractor & Health and Safety Officer	Collection/handling of the waste.	Ongoing
Refuse bins will be emptied and secured. Temporary storage of domestic waste shall be in covered waste skips. Maximum domestic waste storage period will be 10 days.	Life of operation	Environmental Officer, Contractor & Health and Safety Officer	Management of bins and collection of waste	Ongoing, every 10 days
Management outcome: Environmental awareness training				
All personnel and contractors to undergo Environmental Awareness Training. A signed register of attendance must be kept for proof. Discussions are required on sensitive environmental receptors within the project area to inform contractors and site staff of the presence of Red / Orange List species, their identification, conservation status and importance, biology, habitat requirements and management requirements the Environmental Authorisation and within the EMPr. The avoidance and protection of the wetland areas must be included into a site induction. Contractors and employees must all undergo the induction and made aware of the “no-go” to be avoided.	Life of operation	Health and Safety Officer	Compliance to the training.	Ongoing

Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
Management outcome: Erosion				
Speed limits must be put in place to reduce erosion. Reduce dust, especially by earth moving machinery, through wetting the soil surface and putting up signs to enforce speed limit as well as speed bumps built to force slow speeds. Signs must be put up to enforce this.	Life of operation	Project manager, Environmental Officer	Water Runoff from road surfaces	Ongoing
Where possible, existing access routes and walking paths must be made use of.	Life of operation	Project manager, Environmental Officer	Routes used within the area	Ongoing
Areas that are denuded during construction need to be re-vegetated with indigenous vegetation to prevent erosion during flood events and strong winds.	Life of operation	Project manager, Environmental Officer	Re-establishment of indigenous vegetation	Progressively
A stormwater management plan must be compiled and implemented.	Life of operation	Project manager, Environmental Officer	Management plan	Before construction phase: Ongoing

13.14 Avifauna

A separate Avifauna Assessment (contained in **Appendix H3**) was undertaken and the findings from this study follow.

13.14.1 Impact Description

During the construction phase vegetation clearing for the associated infrastructure will lead to direct habitat loss. Vegetation clearing will create a disturbance and will therefore potentially lead to the displacement of avifaunal species. The operation of construction machinery on site will generate noise and cause dust pollution. Should non environmentally friendly dust suppressants be use chemical pollution can take place. Increased human presence can lead to poaching and the increase in vehicle traffic will potentially lead to roadkill.

The principle impacts of the operational phase are electrocution, collisions, fencing, chemical pollution due to chemical for the cleaning of the PV panels and habitat loss. Solar panels have been implicated as a potential risk for bird collisions.

Fencing of the sites can influence birds in the following ways:

- Snagging: Occurs when a body part is impaled on one or more barbs or razor points of a fence.
- Snaring: When a bird's foot/leg becomes trapped between two overlapping wires.
- Impact injuries: birds flying into a fence, the impact may kill or injure the bird.
- Snarling: When birds try and push through a mesh or wire stands, ultimately becoming trapped (uncommon).
- Electrocution: Electrified fence can kill or severely injure birds.
- Barrier effect: Fences may limit flightless birds (e.g. Moulting waterfowl) from resources.

Chemical pollution from PV cleaning, if not environmentally friendly will result in either long term or short term poisoning. Should this chemical run into the water sources it would also impact the whole bird population and not just species found in and around the PV sites.

PV sites require the overall removal of vegetation, this is a measure that is implemented to restrict the risk of fire. The removal of vegetation results in the loss of habitat for a number of species in this case it would be displacing grassland, tree dwellers from the alien clumps and waterfowl. The Phase 1 Site had a greater proportion of grassland habitat, however, the species diversity and abundance were lower. The Phase 2 Site had an overall higher abundance, with the highest diversity of species being waterfowl. Based on these differences the two phases were assessed individually.

Overall, the Phase 1 Site occurs in an area considered to have a low avifaunal importance and sensitivity and is not anticipated to adversely affect the local birdlife. In contrast, however, the entire Phase 2 Site is situated in an area of high avifaunal importance and sensitivity and has the potential

to adversely affected the birdlife at a regional to national scale. However, the likelihood (and consequently the significance) of the main potential impact, namely collisions with PV infrastructure due to the “lake effect”, is uncertain. There is a paucity of scientific research on this topic and opinions on its significance conflicting. It may well be that the solar panels do not result in significantly large numbers of mortalities and that the benefits associated with a renewable energy production such as this outweigh the drawbacks. However, in leu of more robust scientific evidence, the precautionary principle is applied here and the risk of significant collision events deemed plausible. It would be prudent to not underestimate the potential significance of collision events on the local birdlife especially considering the exceptionally high congregations of waterfowl in the area and the nationally important congregations of flamingo at Allanridge and surrounding pans.

It was noted by the Avifaunal Specialist (TBC, 2020c) that the considerably higher species richness and abundance at the Phase 2 Site is attributable to the higher habitat diversity, structural complexity and nutrient-rich waterbird foraging habitat afforded by the large permanent waterbodies within the Phase 2 area. Some of these areas have been artificially inundated due to discharge of both municipal drinking (leaks and overflowing mains) and mine water (decant from shafts).

13.14.2 Impact Assessment

Table 40: Assessment of significance of potential impacts on avifauna associated with the construction phase of Phase 1 (TBC, 2020c)

Impact	Prior to mitigation						Post mitigation					
	Duration of Impact	**Spatial Scope**	**Severity of Impact**	**Sensitivity of Receiving Environment**	**Probability of Impact**	**Significance**	**Duration of Impact**	**Spatial Scope**	**Severity of Impact**	**Sensitivity of Receiving Environment**	**Probability of Impact**	**Significance**
Habitat Loss (Destroy, fragment and degrade habitat, ultimately displacing avifauna)	5	3	4	3	5		4	2	3	3	4	
	Permanent	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Great / harmful/ ecosystem structure and function largely altered	Ecology moderately sensitive/ /important	Definite	**Moderately High**	Life of operation or less than 20 years: Long Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Significant / ecosystem structure and function moderately altered	Ecology moderately sensitive/ /important	Highly likely	**Moderate**
Sensory disturbances (e.g. noise, dust, vibrations)	4	3	3	3	4		3	2	2	3	3	
	Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Significant / ecosystem structure and function moderately altered	Ecology moderately sensitive/ /important	Highly likely	**Moderate**	One year to five years: Medium Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology moderately sensitive/ /important	Likely	**Low**
Collection of eggs and poaching	3	3	3	3	4		2	2	2	2	3	
	One year to five years: Medium Term	Local area/ within 1 km of the site boundary / <	Significant / ecosystem structure and function moderately altered	Ecology moderately sensitive/ /important	Highly likely	**Moderate**	One month to one year: Short Term	Development specific/ within the site boundary / < 100 ha impacted / Linear	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Likely	**Low**

Impact	Prior to mitigation						Post mitigation					
	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
		5000ha impacted / Linear features affected < 1000m						features affected < 100m				
Roadkill	3	3	3	3	4		2	2	2	2	3	
	One year to five years: Medium Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Significant / ecosystem structure and function moderately altered	Ecology moderately sensitive/ /important	Highly likely	**Moderate**	One month to one year: Short Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Likely	**Low**
Chemical pollution associated with dust suppressants	3	4	4	3	4		2	2	2	2	3	
	One year to five years: Medium Term	Regional within 5 km of the site boundary / < 2000ha impacted / Linear features affected < 3000m	Great / harmful/ ecosystem structure and function largely altered	Ecology moderately sensitive/ /important	Highly likely	**Moderately High**	One month to one year: Short Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Likely	**Low**

Table 41: Assessment of significance of potential impacts on avifauna associated with the construction phase of Phase 2 (TBC, 2020c)

Impact	Prior to mitigation						Post mitigation					
	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
Habitat Loss (Destroy, fragment and degrade habitat, ultimately displacing avifauna)	5	4	4	4	5		4	4	4	3	4	
	Permanent	Regional within 5 km of the site boundary / < 2000ha impacted / Linear features affected < 3000m	Great / harmful/ ecosystem structure and function largely altered	Ecology highly sensitive /important	Definite	**High**	Life of operation or less than 20 years: Long Term	Regional within 5 km of the site boundary / < 2000ha impacted / Linear features affected < 3000m	Great / harmful/ ecosystem structure and function largely altered	Ecology moderately sensitive/ /important	Highly likely	**Moderately High**
Sensory disturbances (e.g. noise, dust, vibrations)	4	3	3	3	3		3	2	2	2	2	
	Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Significant / ecosystem structure and function moderately altered	Ecology moderately sensitive/ /important	Likely	**Moderate**	One month to one year: Short Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Significant / ecosystem structure and function moderately altered	Ecology moderately sensitive/ /important	Likely	**Moderate**
Collection of eggs and poaching	3	3	3	3	4		2	3	3	3	4	
	One year to five years: Medium Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features	Significant / ecosystem structure and function moderately altered	Ecology moderately sensitive/ /important	Highly likely	**Moderate**	One month to one year: Short Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Likely	**Low**

Impact	Prior to mitigation						Post mitigation					
	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
		affected < 1000m										
Roadkill	3	3	3	3	4		2	2	2	2	3	
	One year to five years: Medium Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Significant / ecosystem structure and function moderately altered	Ecology moderately sensitive/ /important	Highly likely	**Moderate**	One month to one year: Short Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Likely	**Low**
Chemical pollution associated with dust suppressants	3	4	4	3	4		2	2	2	2	3	
	One year to five years: Medium Term	Regional within 5 km of the site boundary / < 2000ha impacted / Linear features affected < 3000m	Great / harmful/ ecosystem structure and function largely altered	Ecology moderately sensitive/ /important	Highly likely	**Moderately High**	One month to one year: Short Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Likely	**Low**

Table 42: Assessment of significance of potential impacts on avifauna associated with the operational phase of Phase 1 (TBC, 2020c)

Impact	Prior to mitigation						Post mitigation					
	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
Habitat Loss (Destroy, fragment and degrade habitat, ultimately displacing avifauna)	5	4	4	3	4		4	3	3	3	3	
	Permanent	Regional within 5 km of the site boundary / < 2000ha impacted / Linear features affected < 3000m	Great / harmful/ ecosystem structure and function largely altered	Ecology moderately sensitive/ /important	Highly likely	**High**	Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Significant / ecosystem structure and function moderately altered	Ecology moderately sensitive/ /important	Likely	**Moderate**
Sensory disturbances (e.g. noise, dust, vibrations)	4	3	3	3	3		2	2	2	3	3	
	Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Significant / ecosystem structure and function moderately altered	Ecology moderately sensitive/ /important	Likely	**Moderate**	One month to one year: Short Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology moderately sensitive/ /important	Likely	**Low**
Collection of eggs and poaching	4	4	3	4	3		3	2	2	2	2	
	Life of operation or less than 20 years: Long Term	Regional within 5 km of the site boundary / < 2000ha impacted / Linear features	Significant / ecosystem structure and function moderately altered	Ecology highly sensitive /important	Likely	**Moderately High**	One year to five years: Medium Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Possible	**Low**

Impact	Prior to mitigation						Post mitigation					
	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
		affected < 3000m										
Roadkill	4	3	4	4	4		2	2	2	2	3	
	Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Great / harmful/ ecosystem structure and function largely altered	Ecology highly sensitive /important	Highly likely	**Moderately High**	One month to one year: Short Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Likely	**Low**
Collisions with PV and associated infrastructure	4	3	4	3	3		2	2	2	2	3	
	Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Great / harmful/ ecosystem structure and function largely altered	Ecology moderately sensitive/ /important	Likely	**Moderate**	One month to one year: Short Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Likely	**Low**
Electrocution by infrastructure and connections to PV	5	4	4	4	4		3	3	3	2	2	
	Permanent	Regional within 5 km of the site boundary / < 2000ha impacted / Linear	Great / harmful/ ecosystem structure and function largely altered	Ecology highly sensitive /important	Highly likely	**High**	One year to five years: Medium Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features	Significant / ecosystem structure and function moderately altered	Ecology with limited sensitivity/importance	Possible	**Low**

Impact	Prior to mitigation						Post mitigation					
	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
		features affected < 3000m						affected < 1000m				
Chemical pollution associated with measures to keep PV clean	5	3	4	4	5		2	2	2	2	2	
	Permanent	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Great / harmful/ ecosystem structure and function largely altered	Ecology highly sensitive /important	Definite	**High**	One month to one year: Short Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Possible	**Low**
Fencing of PV site	5	4	4	4	5		2	3	3	3	3	
	Permanent	Regional within 5 km of the site boundary / < 2000ha impacted / Linear features affected < 3000m	Great / harmful/ ecosystem structure and function largely altered	Ecology highly sensitive /important	Definite	**High**	One month to one year: Short Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Significant / ecosystem structure and function moderately altered	Ecology moderately sensitive/ /important	Likely	**Low**

Table 43: Assessment of significance of potential impacts on avifauna associated with the operational phase of Phase 2 (TBC, 2020c)

Impact	Prior to mitigation						Post mitigation					
	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
Habitat Loss (Destroy, fragment and degrade habitat, ultimately displacing avifauna)	5	3	4	4	5		4	3	3	3	3	
	Permanent	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Great / harmful/ ecosystem structure and function largely altered	Ecology highly sensitive /important	Definite	**Moderately High**	Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Significant / ecosystem structure and function moderately altered	Ecology moderately sensitive/ /important	Likely	**Moderate**
Sensory disturbances (e.g. noise, dust, vibrations)	4	3	3	3	3		2	2	2	2	3	
	Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Significant / ecosystem structure and function moderately altered	Ecology moderately sensitive/ /important	Likely	**Moderate**	One month to one year: Short Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology moderately sensitive/ /important	Likely	**Moderate**
Collection of eggs and poaching	4	4	3	4	3		3	2	2	2	3	
	Life of operation or less than 20 years: Long Term	Regional within 5 km of the site boundary / < 2000ha impacted / Linear features	Significant / ecosystem structure and function moderately altered	Ecology highly sensitive /important	Likely	**Moderately High**	One year to five years: Medium Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Likely	**Low**

Impact	Prior to mitigation						Post mitigation					
	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
		affected < 3000m						affected < 100m				
Roadkill	4	3	4	4	4		2	2	2	2	3	
	Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Great / harmful/ ecosystem structure and function largely altered	Ecology highly sensitive /important	Highly likely	**Moderately High**	One month to one year: Short Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Likely	**Low**
Collisions with PV and associated infrastructure	4	3	4	3	3		2	2	2	2	3	
	Permanent	Regional within 5 km of the site boundary / < 2000ha impacted / Linear features affected < 3000m	Great / harmful/ ecosystem structure and function largely altered	Ecology highly sensitive /important	Likely	**High**	Life of operation or less than 20 years: Long Term	Regional within 5 km of the site boundary / < 2000ha impacted / Linear features affected < 3000m	Significant / ecosystem structure and function moderately altered	Ecology highly sensitive /important	Likely	**Moderately High**
Electrocution by infrastructure and connections to PV	5	4	4	4	4		3	3	3	2	2	
	Permanent	Regional within 5 km of the site boundary / < 2000ha impacted / Linear features	Great / harmful/ ecosystem structure and function largely altered	Ecology highly sensitive /important	Highly likely	**High**	One year to five years: Medium Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Significant / ecosystem structure and function moderately altered	Ecology with limited sensitivity/importance	Possible	**Low**

Impact	Prior to mitigation						Post mitigation					
	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
		affected < 3000m										
Chemical pollution associated with measures to keep PV clean	5	3	5	4	5		2	2	2	2	2	
	Permanent	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Disastrous / ecosystem structure and function seriously to critically altered	Ecology highly sensitive /important	Definite	**High**	One month to one year: Short Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Possible	**Low**
Fencing of PV site, especially a risk for Greater Flamingos	5	4	4	4	5		2	3	3	3	3	
	Permanent	Regional within 5 km of the site boundary / < 2000ha impacted / Linear features affected < 3000m	Great / harmful/ ecosystem structure and function largely altered	Ecology highly sensitive /important	Definite	**High**	One month to one year: Short Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Significant / ecosystem structure and function moderately altered	Ecology moderately sensitive/ /important	Likely	**Low**

The mitigation measures to manage impacts to avifauna are captured in **Table 44** below.

Table 44: Summary of management outcomes pertaining to impacts to avifauna and their habitats (TBC, 2020c)

Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
Management outcome: Habitats				
Areas of indigenous vegetation, even secondary communities outside of the direct project footprint, should under no circumstances be fragmented or disturbed further. Clearing of vegetation should be minimized and avoided where possible.	Life of operation	Project manager, Environmental Officer	Areas of indigenous vegetation	Ongoing
Where possible, existing access routes and walking paths must be made use of.	Construction / Operational Phase	Environmental Officer & Design Engineer	Roads and paths used	Ongoing
Areas that are denuded during construction need to be re-vegetated with indigenous vegetation to prevent erosion during flood and wind events. This will also reduce the likelihood of encroachment by alien invasive plant species.	Closure Phase/ Rehabilitation phase	Environmental Officer & Contractor	Assess the state of rehabilitation and encroachment of alien vegetation	Quarterly for up to two years after the closure
Rehabilitation of the disturbed areas existing in the project area must be made a priority. Topsoil must also be utilised, and any disturbed area must be re-vegetated with plant and grass species which are endemic to this vegetation type.	Operational / Closure Phase/ Post Closure Phase	Environmental Officer & Contractor	Road edges and BESS footprint	Ongoing
Any woody material removed can be shredded and used in conjunction with the topsoil to augment soil moisture and prevent further erosion.	Closure Phase/ Post Closure Phase	Environmental Officer & Contractor	Road edges and BESS footprint	During Phase
Erosion control and alien invasive management plan	Life of operation	Environmental Officer & Contractor	Erosion and alien invasive species	Ongoing
A fire management plan needs to be complied and implemented to restrict the impact fire might have on the surrounding areas.	Life of operation	Environmental Officer & Contractor	Fire Management	During Phase
Management outcome: Avifauna				
The areas to be developed must be specifically demarcated to prevent movement of staff or any individual into the	Construction/Operational Phase	Project manager, Environmental Officer	Infringement into these areas	Ongoing

Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
surrounding environments. Signs must be put up to enforce this.				
All personnel should undergo environmental induction with regards to avifauna and in particular awareness about not harming, collecting or hunting terrestrial species (e.g. ducks, francolin), and owls, which are often persecuted out of superstition. Signs must be put up to enforce this.	Life of operation	Environmental Officer	Evidence of trapping etc	Ongoing
The duration of the construction should be minimized to as short term as possible, to reduce the period of disturbance on avifauna	Construction / Operational Phase	Project manager, Environmental Officer & Design Engineer	Construction/Closure Phase	Ongoing
Outside lighting should be designed and limited to minimize impacts on fauna. All outside lighting should be directed away from highly sensitive areas. Fluorescent and mercury vapor lighting should be avoided and sodium vapor (red/green) lights should be used wherever possible.	Construction / Operational Phase	Project manager, Environmental Officer & Design Engineer	Light pollution and period of light.	Ongoing
All construction and maintenance motor vehicle operators should undergo an environmental induction that includes instruction on the need to comply with speed limit (40km/h), to respect all forms of wildlife. Speed limits must still be enforced to ensure that road killings and erosion is limited.	Life of operation	Health and Safety Officer	Compliance to the training.	Ongoing
Schedule activities and operations related to the construction phase during least sensitive periods, to avoid migration, nesting and breeding seasons (July-September). This refers to high and very high sensitivity areas / habitat.	Life of operation	Project manager, Environmental Officer & Design Engineer	Activities should take place during the day in the case.	Ongoing
All areas to be developed must be walked through prior to any activity to ensure no nests or avifauna species are found in the area. Should any SCC not move out of the area or their nest be found in the area a suitably qualified specialist must be consulted	Planning, Construction and Decommissioning	Project manager, Environmental Officer	Presence of Nests and faunal species	Planning, Construction and Decommissioning

Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
to advise on the correct actions to be taken.				
The design of the proposed PV and BESS must be of a type or similar structure as endorsed by the Eskom-EWT Strategic Partnership on Birds and Energy, considering the mitigation guidelines recommended by Birdlife South Africa (Jenkins *et al.,* 2017).	Planning and construction	Environmental Officer & Contractor, Engineer	Presence of electrocuted birds or bird strikes	Ongoing
Use environmentally friendly cleaning and dust suppressant products	Construction and operation	Environmental Officer & Contractor, Engineer	Presence of chemicals in and around the project area	Ongoing
Fencing mitigations: • Top 2 strands must be smooth wire • Routinely retention loose wires • Minimum 30cm between wires • Place markers on fences	Planning, construction and operation	Environmental Officer & Contractor, Engineer	Presence of birds stuck /dead in fences Monitor fences for slack wires	Ongoing
Any exposed parts must be covered (insulated) to reduce electrocution risk.	Planning and construction	Environmental Officer & Contractor, Engineer	Presence of electrocuted birds	Ongoing
All the parts of the infrastructure must be nest proofed and place anti perching devices on areas that can lead to electrocution	Lifetime of project	Environmental Officer & Contractor, Engineer	Presence of electrocuted birds	Ongoing
As far as possible power cables within the project area should be thoroughly insulated and preferably buried.	Planning and construction	Environmental Officer & Contractor, Engineer	Exposed cables	Ongoing
White strips should be placed along the edges of the panels, to reduce similarity to water and deter birds and insects. Consider the use of bird deterrent devices to limit collision risk.	Planning and construction	Environmental Officer & Contractor, Engineer	Presence of dead birds in the project area	Ongoing
BESS must be covered in non-reflective surfaces to ensure heat is not radiated of it and that fire cannot be caused by the reflections	Planning and construction	Environmental Officer & Contractor	Fire incidents	Ongoing

In addition to the various mitigation measures stipulated, it is recommended that the Project follow its phased approach. If / when the project receives all due authorisations, development should start on the southern end of the Phase 1 Site and proceed north. Bird mortalities in and around this area should be monitored. Monitoring should occur prior to construction and continue through operation for at least a year, but preferably two. The decision to develop the northern Phase 2 Site should then only be considered based on the findings of the mortality monitoring studies and this report.

Thereafter, if the monitoring studies suggest low insignificant mortality rates Phase 2 should then be initiated within a small portion of the western transformer block. Here bird mortalities should be monitored in much the same way and the decision to develop the eastern block informed by this data. Regardless, development of PV infrastructure and fences within the eastern block should be avoided within the areas identified as High and Very High sensitivity.

13.15 Agricultural

The findings from the Agricultural Impact Assessment (contained in **Appendix H4**) follow.

13.15.1 Impact Description

The following impacts were identified and assessed from an agricultural perspective:

- Loss of high potential land –
  - The extent is local with a loss of 629 hectares of moderate to high potential land. All the land is virgin at the moment because it has not been cultivated for at least 10 years.
  - The loss of high potential land will not influence production because it is not used for crop production at present.
- Loss of grazing land –
  - The loss of grazing land is permanent if the Project goes ahead. The extent of the impact is local and will affect 920 hectares that is now used as grazing by local landless farmers.
  - The significance of the loss to the landless farmers is high because they graze their cattle on any land around Odendaalsrus that is vacant or available. Livestock is their livelihood and possibly the only family income. Losing the grazing for them may be devastating.
- Loss of farming income from livestock –
  - There is about 920 hectares that is used as grazing that can carry about 130 large livestock. Although the property does not belong to the herders, they will nevertheless experience a loss of income if the grazing is no longer available to them. The likely income from livestock that will be to these farmers is estimated at around R660 270 per year. **Figure 101** below indicates the surrounding farming activities. The green shaded portions are cultivated, the area delineated in black is the only alternative grazing land that can be made available to these farmers. It is, however, not certain if this land is in private ownership and not available for landless farmers. The fate of the landless farmers will require additional investigation to come up with a suitable solution.
- Loss of farming infrastructure –
  - Two kraals and a house of a landless farmer are found on the Phase 2 Site. Because there will be a land use change, these structures will have to be removed and the occupants compensated. Although they do not own the land they are, nevertheless, farming the property and erected the structures. The significance of the loss is on local level and will impact the farm occupiers directly.
- Biological –

- Dust created by construction activates can impact on the livestock carrying capacity of adjoining properties. The soil types on the properties are very susceptible to erosion when the vegetation cover is removed.

❖ Other –

- Because the landowner does not farm the properties, the number of employed in farming will not be influenced. The cattle herders will be affected.

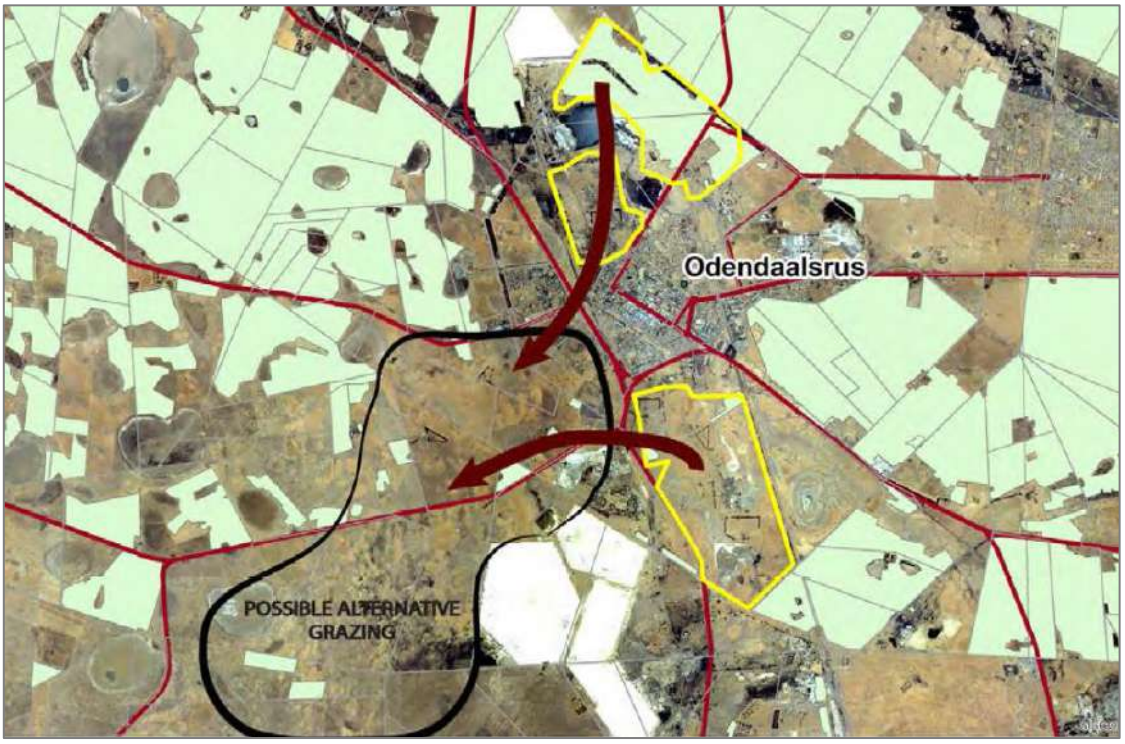


Figure 101: Alternative grazing for landless cattle farmers (Index, 2020)

13.15.2 Impact Assessment

Table 45: Assessment of agricultural impacts (Index, 2020)

POTENTIAL ENVIRONMENTAL IMPACT / NATURE OF IMPACT	Extent	Probability	Reversibility	Irreplaceable	Duration	Magnitude	TOTAL (SP)	Significance	Extent	Probability	Reversibility	Irreplaceable	Duration	Magnitude	TOTAL (SP)	Significance
LOSS OF HIGH POTENTIAL LAND																
Direct loss of land	1	4	3	2	4	2	**28**	**M**	1	4	3	2	4	2	**28**	**M**
Fragmentation	1	1	1	1	1	1	**5**	**L**	1	1	1	1	1	1	**5**	**L**
LOSS OF GRAZING LAND																
Direct loss of land	2	4	4	4	4	4	**72**	**H**	2	4	2	2	2	2	**24**	**M**
Fragmentation	1	1	1	1	1	1	**5**	**L**	1	1	1	1	1	1	**5**	**L**
LOSS OF AGRICULTURAL PRODUCTION																
Loss of crop production	1	1	4	4	4	2	**28**	**M**	1	1	4	4	4	2	**28**	**M**
Loss of grazing	2	4	4	4	4	2	**54**	**H**	2	2	4	2	2	2	24	**M**
LOSS OF AGRICULTURAL INFRASTRUCTURE																
Direct loss	1	4	3	1	4	1	**26**	**M**	1	1	1	1	1	1	**5**	**L**

The mitigation measures identified as part of the Agricultural Impact Assessment are captured in **Table 46** below.

Table 46: Mitigation measures for agricultural impacts (Index, 2020)

Impact	Mitigation
Loss of high potential and cultivated land	High potential land cannot be replaced elsewhere. No mitigation is possible.
Loss of grazing land	The loss of grazing to the landless farmers poses severe problems and must be addressed. Their grazing requirements must be met in some way. A few mechanisms can be used to mitigate their loss. These farmers may have ESTA rights because of their having occupied the property seemingly for some time. Removing or moving the occupiers will have legal ramifications and must be addressed with sensitivity. The Department of Agriculture Rural Development and Land Reform has initiated a number of programmes to assist disadvantaged groups gain access to land. These programmes can provide opportunities for these and other farmers in a similar situation to obtain land either in rental or land ownership arrangements. Some of these programs promote ownership through redistribution of land. Another option is for the municipality to make land available through obtaining land in terms of a Municipal Commonage.
Loss of farming infrastructure	The only mitigation is to replace the infrastructure elsewhere or compensate the occupier for the loss. A compounding problem is that the infrastructure is located in the vicinity of where the grazing opportunity exists and if this lost, then the question is at which locality it should be replaced.
Biological	Keep the construction period as short as possible and employ dust reduction methods when constructing access roads. Because of the possible impact of wind erosion, it is recommended that the construction of the footprints takes place during periods when winds with high speeds are not expected. It is accepted, however, that this may not be practical. Remove the topsoil where construction will be done and store it in a safe place. Restore the soil and vegetate the disturbed areas.

13.16 Phase 1 Cultural Heritage Impact Assessment

The findings from the Phase 1 Cultural Heritage Impact Assessment (contained in **Appendix H5**) follow.

13.16.1 Impact Description

The followings sites, features or objects of cultural significance were identified:

- Informal burial site with five or six graves. The graves probably belong to former farm labourers. Not all have headstones with dates. The dated ones vary between 1959 and 1963.
- A number of houses that used to be part of the compound for housing mine workers. From the style and materials used, it seems as if the houses date to at least two different periods. From available information it was deduced that the older section of the settlement dates to the early 1950s, having been built as the mine was first developed. The houses are still occupied, and it is the intension of the developers to relocate all the people.

13.16.2 Impact Assessment

Table 47: Assessment of cultural heritage impacts (van Schalkwyk, 2020)

Site No.	Site type	NHRA category	Field rating	Impact rating: Before/After mitigation
7.2.3.1	Graves, Cemeteries and Burial Grounds	Section 36	Generally protected: High significance – Grade 4A	Medium (36) Low (24)
Mitigation: (1) Avoidance/Preserve: The site should be retained *in situ* and a buffer zone should be created around it, either temporary (by means of danger tape) or permanently (wire fence or built wall). (2) Archaeological investigation/Relocation of graves: Mitigation is to excavate the site by archaeological techniques, document the site (map and photograph) and analyse the recovered material to acceptable standards. This also applies for graves older than 60 years that are to be relocated. For graves younger than 60 years a permit from SAHRA is not required. However, all other legal requirements must be adhered to.				
7.2.3.2	Structures older than 60 years-	Section 34	Generally protected: High significance – Grade 4A	High (70) Low (24)
Mitigation: (2) Archaeological investigation: This is appropriate where development occurs in a context of heritage significance and where the impact is such that it can be mitigated. Mitigation is to document the site (map and photograph) and analyse the recovered material to acceptable standards.				

Legal requirements:

- If the graves identified at the Phase 2 Site are to be relocated for the purposes of the Project, proper procedures must be followed after obtaining all the necessary permits.
- The identified Txolwene compound at the Phase 2 Site is older than 60 years, is rare and therefore formally protected by the NHRA. Impact on or destruction of these structures for the purposes of the Project are therefore subject to permit requirements which must be obtained from SAHRA/PHRA prior to any work being carried out.
- If heritage features are identified during construction, as stated in the management recommendation, these finds would have to be assessed by a specialist, after which a decision will be made regarding the application for relevant permits.

13.17 Visual Impact Assessment

The findings from the Visual Impact Assessment (contained in **Appendix H8**) follow.

13.17.1 Impact Description

Based on the impact assessment, it was evident that the proposed PV Plants will have a moderate visual impact during the development phases of the Project, prior to mitigation measures being implemented. This will mainly be attributed to the vegetation clearing during the construction phase, and introduction of PV structures in areas where no other structures are present, proposed footprints are not neat and well maintained. With improved technology and design techniques, PV facilities are no longer associated with glare, however, PV Plants can create increased visibility and

contrast through the creation of geometric patterns of reflected light caused by simultaneous reflection of sunlight from regularly-spaced metal surfaces in the collector array. The reflected light may not necessarily cause discomfort to the viewer, during the daytime, and may change dramatically as the observer moves. It should be noted that the PV panels will not contribute to night time light pollution in the area, since no reflection of the sun occurs at night. However, with the implementation of mitigation measures as outlined in the report, the visual impact on the receiving environment will be lowered to moderately low and low visual impacts.

13.17.2 Impact Assessment

Table 48: Assessment of visual impacts (SAS, 2020)

Impact	Unmanaged	Managed
Construction phase		
1: Impact on landscape character and sense of place	Medium High	Medium Low
2: Visual intrusion and VAC impacts	Medium High	Medium Low
3: Visual exposure and visibility impacts	Medium High	Low
4: Impacts due to nighttime lighting	Low	Low
Operational phase		
1: Impact on landscape character and sense of place	Medium Low	Low
2: Visual intrusion and VAC impacts	Medium High	Low
3: Visual exposure and visibility impacts	Medium Low	Low
4: Impacts due to nighttime lighting	Medium Low	Low
Decommissioning Phase		
1: Impact on landscape character and sense of place	Medium Low	Low
2: Visual intrusion and VAC impacts	Medium Low	Low
3: Visual exposure and visibility impacts	Medium Low	Low
4: Impacts due to nighttime lighting	Low	Low

13.18 Air Quality

13.18.1 Impact Description

Sensitive receptors to dust and other air quality impacts in the study area include people residing in the surrounding urban and rural areas, ecological features (fauna and flora) and crops.

The Project proposes the use of a renewable resource (solar), which is a cleaner form of energy generation than using fossil fuels, with environmental benefits.

Sources of air quality impacts associated with the Project may include:

- Construction phase –
  - Dust from the use of dirt roads by construction vehicles;
  - Dust from bare areas that have been cleared for construction purposes; and

- Emissions from construction equipment and machinery.

❖ Operational phase –

- Impacts to air quality caused by the operation and maintenance of the facility include dust from the use of dirt roads and tailpipe emissions from vehicles.

Mitigation measures are included in the EMPr to ensure that the air quality impacts during the construction phase are suitably monitored and managed and that regulated thresholds are not exceeded. The EMPr also includes measures to control and minimize greenhouse gas emissions by optimising the utilisation of construction resources, as well as preventing fires related to construction activities.

During the operational phase of the PV Plants, local atmospheric pollution may reduce the irradiation received or contain significant levels of airborne corrosive substances. The efficiency of the solar plants be also reduced if the modules are soiled (covered) by particulates/dust.

13.18.2 Impact Assessment

Environmental Feature	**Air Quality**
Relevant Alternatives & Activities	**Construction domain of development footprint**
Project life-cycle	**Construction phase**
Potential Aspects & Impacts	**Proposed Management Objectives / Mitigation Measures**
• Excessive dust levels as a result of construction activities • Emissions from construction equipment and machinery	• Appropriate dust suppression measures or temporary stabilising mechanisms to be used when dust generation is unavoidable (e.g. dampening with water, chemical soil binders, straw, brush packs, chipping), particularly during prolonged periods of dry weather. Dust suppression to be undertaken for all bare areas, including construction area and access roads. Note that all dust suppression requirements should be based on the results from the dust monitoring and the proximity of sensitive receptors. • Speed limits to be strictly adhered to. • Air quality to be monitored (baseline and during construction) for dust fallout and particulate matter. Sampling locations to consider major sources of dust and sensitive receptors. • All vehicles and machinery used at the site are to be in good working condition and fitted with appropriate emission controls • Plant to be operated efficiently and turned off when not in use.

	+/- Impacts	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**
Before Mitigation	-	local	medium	short-term	likely	3
After Mitigation	-	local	low	short-term	unlikely	1

Environmental Feature	Air Quality
Relevant Alternatives & Activities	**Operation of the Solar PV Plants at the Phase 1 & Phase 2 Sites**
Project life-cycle	**Operational phase**
Potential Aspects & Impacts	**Proposed Management Objectives / Mitigation Measures**
• Influence of air quality and soiling on operational efficiency of Solar PV Plants	• An appropriate maintenance and cleaning plan is to be developed for the PV panels.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	-	local	medium-high	long-term	likely	3
After Mitigation	-	local	low	long-term	unlikely	1

13.19 Noise

13.19.1 Impact Description

Sensitive receptors to noise impacts in the study area include people residing in the surrounding urban and rural areas, as well as ecological receptors (fauna).

During construction, localised increases in noise will be caused by earthworks, establishment and operating of site construction laydown area, construction of PV Plants and ancillary infrastructure, transportation of construction workers and material, activities at the construction camp, and general construction noise.

Solar PV facilities produce electricity during the daytime hours, when the sun's rays are collected by the panels. When there is little to no irradiance, noise emitted by the equipment is significantly reduced. The main sources of noise from the Project will be the rack mounted inverters and the central step-up transformer, which are only expected to be audible to operational staff who will come in close proximity to these components. Other sources of noise include operation and maintenance vehicles and activities.

Noise that emanates from construction and operational activities are addressed through targeted best practices in the EMPr. The associated regulated standards need to be adhered to.

Project personnel working on the construction site will experience the greatest potential exposure to the highest levels of noise and vibration. Workplace noise and vibration issues will be managed as part of the Occupational Health and Safety Management System to be employed on site, which will include specific measures aimed at preventing hearing loss and other deleterious health impacts.

13.19.2 Impact Assessment

Environmental Feature	Noise
Relevant Alternatives & Activities	**Construction domain of development footprint**
Project life-cycle	**Construction phase**
Potential Aspects & Impacts	**Proposed Management Objectives / Mitigation Measures**
• Noise as a result of construction activities	• The provisions of SANS 10103:2008 will apply to all areas within audible distance of residents. • Working hours to be agreed upon with Project Manager, so as to minimise disturbance to landowners/occupiers and community members. • Construction activities generating output levels of 85 dB or more will be confined to normal working hours. • Noise preventative measures (e.g. screening, muffling, timing, pre-notification of affected parties) to be employed.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	-	local	medium	short-term	likely	2
After Mitigation	-	local	low	short-term	unlikely	1

13.20 Hazardous Substances & Waste

13.20.1 Impact Description

Improper management of hazardous substances and waste may pollute the biophysical environment (air, water and soil), and pose risks to humans, flora and fauna. It may also cause visual impacts.

Hazardous substances to be stored and used during the construction and operational phases of the Project include oil, fuel, solvents, pesticides, lithium-ion batteries (BESS), etc.

General construction waste will comprise of surplus or off-specification materials (e.g. concrete, wooden pallets, packaging paper or plastic, wood, metals, etc.) and construction debris. Domestic waste will include food waste, plastic, glass, aluminum cans and waste paper. A small proportion of the waste generated during construction phase will be hazardous and may include used oil, hydraulic fluids, waste fuel, grease and waste oil containing rags. Wastewater, including water adversely affected in quality through construction-related activities and human influence, will include sewage, water used for washing purposes (e.g. equipment, staff) and drainage over contaminated areas (e.g. workshop, equipment storage areas).

Waste types likely to be generated during routine operation and maintenance activities include dielectric fluids, clearing agents, oils, solvents, wastewater, defunct / damaged PV cells and domestic waste.

Provision is made in the EMPr to manage impacts associated with hazardous substances and waste.

13.20.2 Impact Assessment

Environmental Feature	**Hazardous Substances & Waste**
Relevant Alternatives & Activities	**Storage and use of hazardous substances & generation of waste**
Project life-cycle	**Construction & operational phases**
Potential Aspects & Impacts	**Proposed Management Objectives / Mitigation Measures**
• Environmental pollution caused by improper management of hazardous substances and waste	• Hazardous substances shall be stored and handled in accordance with the appropriate legislation and standards, which include the Hazardous Substances Act (Act No. 15 of 1973), Occupational Health and Safety Act (No. 85 of 1993), relevant associated Regulations and applicable SANS and international standards. • Storage and use of hazardous materials will be strictly controlled to prevent environmental contamination and will adhere to the requirements stipulated on the Material Safety Data Sheets. • In the event of spillages of hazardous substances the appropriate clean up and disposal measures shall be implemented. • BESS to have electrical and fire protection measures in the form of battery temperature monitoring, circuit breakers, fire detection and fire suppression as per regulatory requirements. • Waste to be disposed of at a licenced waste disposal facility. • Water used for cleaning of PV panels will not contain any harmful chemicals or additives. • Wastewater to be properly disposed of. Contaminated water will not be discharged to the environment. • Used lithium-ion batteries and PV panels are to be removed by the suppliers, who are to recycle material and recover any hazardous substances (as relevant). Provision to be made in the supply agreements between the Proponent and the selected suppliers.

	+/- Impacts	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**
Before Mitigation	-	local	medium-high	long-term	likely	3
After Mitigation	-	local	low	long-term	unlikely	1

Potential risks and related control measures associated with the BESS facility are captured in **Table 49** below. A detailed risk assessment will need to be undertaken based on the type of BESS technology selected and the final design of the Solar PV Plant. The outcomes of this risk assessment will need to be incorporated into the Operational EMPr.

Table 49: Proposed management of risk to BESS (based on Arup, 2018)

No.	Risk	Possible Consequences	Control Measures
1	Risk posed by veld fires (external to site) to BESS facility	Damage to BESS	▪ Implementation of a fire break around the site ▪ Include measures to deal with veld fires in the Emergency Response Plan ▪ Coordination with local fire authorities ▪ Provide fire extinguishers on site
2	Damage caused to cells by an external event	Lithium Ion Cell leakage	▪ Lithium batteries do not contain free liquid electrolytes ▪ Individual cells are used which minimises extent of release
3	Damage to batteries from vehicle collision	▪ Damage to battery cells ▪ Electrical risks	▪ Use of perimeter fence around BESS facility ▪ Appropriately designed internal access roads ▪ Limit of speed limit within fenced facility ▪ Earthing system installed as per normal electrical facilities
4	Transformer oil leakage due to corrosion of tank base or leakage of oil tank	Leakage of transformer oil to environment, with resultant pollution	▪ Use of fully bunded oil storage for transformers ▪ Regular tank inspections
5	Collapse or fall of overhead electricity line onto BESS facility	Damage to BESS facility	▪ BESS facility to be located outside of power line servitude
6	Security breach into BESS facility for theft of components	Theft of equipment or risk to personnel	▪ Installation of security fencing around entire Solar PV Plant and around the BESS facility ▪ Installation of security system to monitor key areas ▪ Inspections to monitor for security breaches
7	Spread of fire across BESS facility between battery packs	Localised fire causing damage by spreading to BESS facility	▪ Separation distances between battery packs in accordance with manufacturer recommendations ▪ Adherence to fire management measures ▪ Provide fire extinguishers on site ▪ BESS area will have a non-flammable buffer area to prevent the spread of fire. ▪ BESS will have electrical and fire protection measures in the form of battery temperature monitoring, circuit breakers, fire detection and fire suppression
8	Electrocution due to electrical fault	Electrical fault causing personnel injury	▪ Normal electrical standards and installation of appropriate earthing system ▪ Use of appropriately qualified maintenance personnel
9	Lightning striking BESS facility	Lightning strike causing damage to facility or personnel	▪ Include lightning protection measures, if deemed necessary
10	High rainfall and flooding to site	Damage to electrical equipment	▪ BESS facility to be developed outside of the 1:100 year floodline of any watercourse
11	High wind events and seismic events	Structural damage to equipment or battery packs	▪ Appropriate design of BESS facility, taking into consideration *inter alia* climatic and geotechnical conditions

13.21 Traffic

13.21.1 Impact Description

The findings from the Traffic Impact Assessment (contained in **Appendix H9**) follow.

The development can broadly be categorised as an industrial type of development but cannot from a trip generation point of view be regarded as a typical industrial development. Industrial developments are in general relatively labour intensive with people working at the facility, and products being transported to and from the site. In this instance the facilities will mostly function unattended and the only trips generated during the operating phase will be security and maintenance trips, which are expected to be limited.

The main trip generation will be during the construction periods when the sites are prepared, and actual construction takes place. Trip generation during construction is difficult to accurately estimate as it depends on the tempo of construction and types - and size of vehicles used to transport materials. Based on similar projects it is, however, typically expected that during the construction phase, traffic will peak at approximately 10 large delivery vehicles and 40 to 50 concrete trucks per day while the footings are being cast and then drop to about 20 to 30 large delivery vehicles per day while the electrical reticulation is being installed and the trackers are being erected.
Internal service roads will be limited to a minimum.

Relative to existing volumes, traffic volumes will notably increase during certain stages of the construction period but considering current traffic volumes no capacity problems are expected.

The operational phase includes all operations needed to be carried out to maintain the PV power plant in a full operational mode. The traffic generated by the Project during the operational phase, once the plant is generating electricity, is normally limited. As traffic volumes on all the roads in the area are medium to low, the impact of these trips from a capacity point of view will be limited.

13.21.2 Impact Assessment

Environmental Feature	Traffic and Access
Relevant Alternatives & Activities	**All construction activities that may affect existing road networks**
Project life-cycle	**Construction**
Potential Aspects & Impacts	**Proposed Management Objectives / Mitigation Measures**
• Disruptions to existing road users. • Safety risks. • Crossing of main roads during construction. • Increase in dust levels. • Use of road network by construction vehicles.	• Accommodate traffic along A48 / S86 during construction. • Determine and document the road conditions of the main and secondary roads (R30, A48 / S86) that will be affected by construction traffic, as relevant. Maintain adequate road conditions. • Obtain the necessary approval for road upgrades, pipe-jacking and wayleave for road construction from the relevant road authorities (DPRT), as applicable. • Clearly demarcate all construction access roads. • Proper access control is to be maintained to prevent livestock / game from accessing construction areas, as well as for any other unauthorised access. • Strict adherence to speed limits by construction vehicles on public roads and access roads. Appropriate speed limits need to be posted on all access roads according to the geometric design and limitations of heavy vehicles. • The access roads need to provide sufficient width for heavy vehicles to navigate around curves in the road. • Ensure adequate maintenance of construction vehicles. • When construction vehicles are required to cross provincial and district roads (as relevant) appropriate safety and traffic calming measures need to be in place. This will include flag men, speed reductions and warning signage. • Limit internal service roads to a minimum. • Implement measures to manage dust caused by site traffic.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	-	local	medium-high	short-term	almost certain	3
After Mitigation	-	local	low	short-term	moderate	1

Project life-cycle	Operation
Potential Aspects & Impacts	**Proposed Management Objectives / Mitigation Measures**
• Disruptions to existing road users. • Safety risks. • Accessing the Phase 1 and Phase 2 Sites from main roads. • Dust generated from use of internal gravel roads.	• Accommodate traffic along A48 / S86 during operational phase. • Maintain internal roads. • Maintain proper access control to the Phase 1 and Phase 2 Sites. • Strict adherence to speed limits by operational vehicles on public roads and access roads. • Ensure adequate maintenance of operational vehicles. • Implement measures to manage dust through use of internal gravel roads.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	-	local	medium-high	long-term	almost certain	3
After Mitigation	-	local	low	long-term	moderate	1

13.22 Civil Aviation

13.22.1 Impact Description

Possible impacts that may be caused by a Solar PV Plant to civil aviation include potential glare and glint from *inter alia* PV panels, steel array mounting, glass windows and rooftops that might cause temporary loss of vision to pilots on arrival or departure, as well as obstacles associated with the PV facility (e.g. power lines) that may pose a risk to safe air navigation.

Glint and glare are caused by many reflective materials, whereby light from the sun is reflected off such materials with a potential to cause hazard, nuisance or unwanted visual impact. It is noted that solar panels are designed to absorb, not reflect, irradiation.

The Welkom Airport is located approximately 9 km to the south-west of the Phase 1 Site. Accordingly, no Glint and Glare Impact Assessment in terms of Obstacle Notice 4/2017, was undertaken. The South African Civil Aviation Authority (SACAA) was engaged with as part of the EIA and the Proponent is undertaking the Application Process.

According to the National Web-based Environmental Screening Tool (refer to report appended to the Application Form), the sensitivity of the Phase 1 and Phase 2 Sites in terms of civil aviation is low (see **Figure 102** and **Figure 103** below), as there are “no major or other types of civil aviation aerodromes” in proximity to the sites.

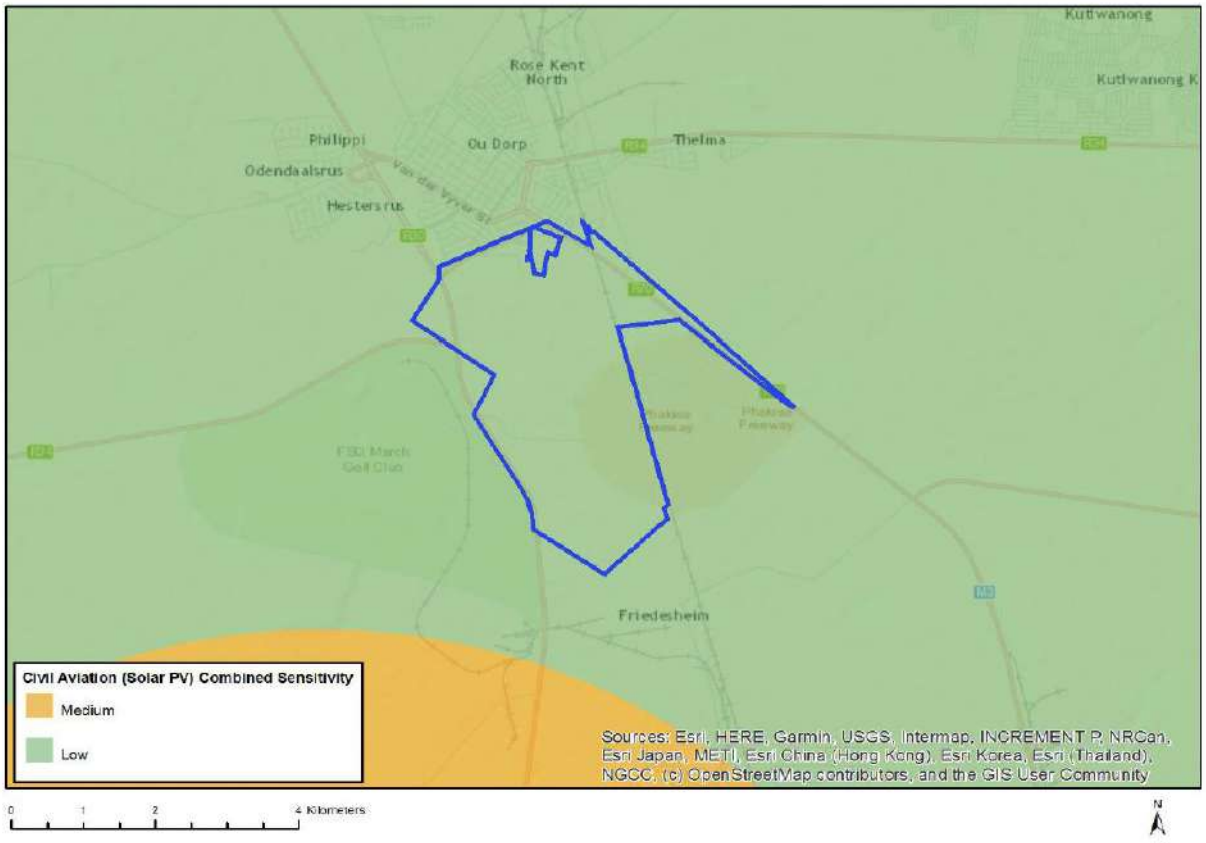


Figure 102: Map of relative civil aviation (solar PV) theme sensitivity for Phase 1 Site

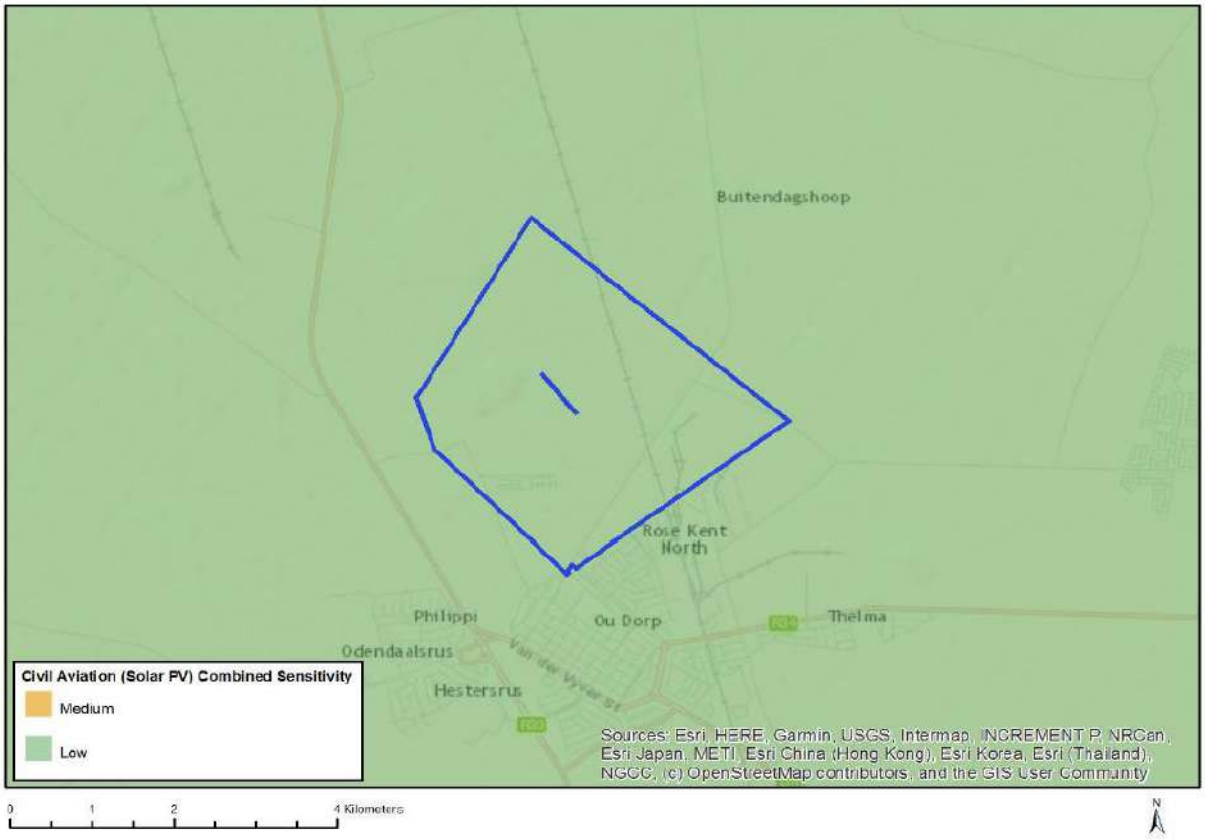


Figure 103: Map of relative civil aviation (solar PV) theme sensitivity for Phase 2 Site

13.22.2 Impact Assessment

The impacts associated with glint and glare were assessed as part of the Visual Impact Assessment.

13.23 Existing Structures and Infrastructure

13.23.1 Impact Description

Potential impacts of the Project to existing structures and infrastructure include:

- Disruptions to services or damage caused as a result of construction activities;
- Disruptions to traffic on roads to be used by construction vehicles (see **Section 13.21** above); and
- Construction-related disturbances (e.g. noise, dust).

A detailed survey will be conducted to identify all physical features that are located within the final project footprint. Optimisation of the layout during the design phase will seek to avoid existing structures and infrastructure, where possible. Where avoidance is not possible, suitable compensation measures need to be established, as necessary. In this regard, it is noted that the vent shaft and sub-station on the Phase 1 Site associated with the mining activities, are to remain (refer to **Section 13.9** above).

13.23.2 Impact Assessment

Environmental Feature	Existing Structures and Infrastructure
Relevant Alternatives & Activities	**All activities that affect existing structures and infrastructure**
Project life-cycle	**Construction & operational phases**
Potential Aspects & Impacts	**Proposed Management Objectives / Mitigation Measures**
• Disruption of existing services • Damage to existing structures and infrastructure	• Identify and record existing services and infrastructure. • Conform to requirements of relevant service providers and infrastructure custodians (e.g. Eskom. Transnet, Telkom, SANRAL, DPRT, etc.). • Ensure access to infrastructure is available to service providers at all times. • Immediately notify service providers of disturbance to services. Rectify disturbance to services, in consultation with service providers. Maintain a record of all disturbances and remedial actions on site. • Adequate reinstatement and rehabilitation of affected environment.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	-	local	medium-high	short-term to permanent	likely	3
After Mitigation	-	local	low	short-term	unlikely	1

13.24 Health and Safety

13.24.1 Impact Description

13.24.1.1 Construction Phase

Health and safety related risks associated with the Project during the construction phase include the following:

- Hazards related to construction work;
- Increased levels of dust and particulate matter, as well as noise;
- Water (surface and ground) contamination;
- Poor water and sanitation services to construction workers;
- Communicable diseases;
- Psychosocial disorder (e.g. social disruptions);
- Safety and security to the local community; and
- Lack of suitable health services.

These risks are addressed through mitigation measures identified under other environmental features, such as socio-economic environment, surface water, air quality, noise, as well as best practices included in the EMPr. Additional management requirements will be included in the Project's Occupational Health and Safety system.

13.24.2 Impact Assessment

Environmental Feature	Health and Safety
Relevant Alternatives & Activities	**Construction activities**
Project life-cycle	**Construction phase**
Potential Aspects & Impacts	**Proposed Management Objectives / Mitigation Measures**
• Health and safety risks during construction	• Dedicated Occupational Health and Safety system to be implemented by the Contractor. • Undertake a hazard identification and risk assessment and identify preventive and protective measures. • Conduct basic safety awareness training with construction workers. • Provide all workers with the necessary Personal Protective Equipment (PPE). • Prevent environmental contamination. • Provide potable water and sanitation services to workers. • All workers shall be clearly identifiable and to remain within construction domain during working hours. • Prepare an Emergency Response Plan. • Ensure adequate control of communicable diseases. • Maintain access control to construction domain.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	-	local	high	short-term to permanent	likely	3
After Mitigation	-	local	low	short-term	unlikely	1

13.24.2.1 Operational phase –

The predominant types of hazards associated with battery systems include electric shock, stored energy, chemical, flammable emission, thermal runaway, transportation, kinetic energy and manual handling (Energy Storage Council, 2016). A lithium-ion based BESS must be designed with proper disconnects, relays, thermal management, enclosures, layout, monitoring and controls to mitigate risks to the required level of safety. Operating strategies spanning proper planning, risk assessment, storage methods, maintenance protocols, and response protocols are the other important factors in mitigating lithium-ion safety risks (Butler, 2013).

Electromagnetic fields (EMFs) consist of electric and magnetic fields and are produced whenever electricity is used. Research into electric and magnetic fields undertaken at utility scale PV installations in California by Chang and Jennings (1994), indicated that magnetic fields were significantly less for solar arrays than for household applications. Chang and Jennings (1994) found magnetic fields from solar arrays were not distinguishable from background levels at the site boundary, suggesting the health risk of EMFs from solar arrays is minimal.

Other health and safety related associated with the Project during the operational phase include the following:

- ❖ Leaching of materials from broken or fire damaged PV modules;
- ❖ Injuries to workers from operation and maintenance activities (vehicle accidents, replacement of components/parts, etc.) and;
- ❖ Emergency fire hazards; and
- ❖ Electrocution of workers;

Environmental Feature	Health and Safety
Relevant Alternatives & Activities	Operation and maintenance activities
Project life-cycle	Operational phase
Potential Aspects & Impacts	Proposed Management Objectives / Mitigation Measures
• Health and safety risks posed by operation and maintenance activities	• Dedicated Occupational Health and Safety system to be implemented by the Operator of the PV Plant. • Conduct basic safety awareness training with all operational staff. • Temporary Contractors to adhere to Occupational Health and Safety requirements. • Provide potable water and sanitation services to operational staff. • Prepare an Emergency Response Plan. • Measures at the battery storage area to manage fire risks will include a non-flammable buffer area to prevent the spread of fire, battery temperature monitoring, circuit breakers, fire detection and fire suppression as per fire and electrical regulatory requirements. • Provide adequate access/egress for installation and maintenance at the BESS.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	-	local	high	long-term	likely	3
After Mitigation	-	local	low	long-term	unlikely	1

13.25 Socio-Economic Environment

13.25.1 Impact Description

The potentially significant socio-economic impacts associated with the Project, as identified as part of the Socio-Economic Impact Assessment (contained in **Appendix H7**), are summarised in **Table 50** below.

Table 50: Summary of potentially significant socio-economic impacts (Nemai Consulting, 2020)

Activity	Aspect	Potential Impact
Land Acquisition and Servitude Rights Acquisition	Land Acquisition	Loss of land utilised by occupants found on both the Phase 1 and Phase 2 Sites, together with the livestock farming practices taking place at the sites.
	Re-location	Relocation of households found in both Phase 1 and Phase 2 sites.
	Servitude Rights	Reduced access to land/structures
		Reduced access to productive land

Activity	Aspect	Potential Impact
Scheme Operations	Enabling development through the network expansion of electricity.	Economic growth and induced impacts
	Supply of goods and services to the scheme	Opportunity for local business
	Administration and Technical Input	Employment of local people
		Skills development
Construction Phase	Access onto properties	Damage to property or equipment
		Damage or wear to access roads
		Improvement of access in the Project area
		Security concerns
	Construction of infrastructure	Proximity to construction work and associated inconvenience and dangers
		Employment of local people and SMME's
		Sourcing of equipment, machinery and services locally
		Noise
		Influx of workers
		Employment of local labour and SMME's
		Increased traffic
	Transport of goods to site and employment of staff	Increased traffic
		Security concerns
		Improved access to amenities

13.25.2 Impact Assessment

Environmental Feature	Impacts created by providing a secure, sufficient power supply
Project life-cycle	Operational phase
Potential Impact	**Proposed Management Objectives / Mitigation Measures**
Economic	• Increased productivity. • More flexible economy.
Social Benefits	• Convenient and less time-consuming daily tasks. • Facilitation of education. • Facilitation of mass transport. • Improved productivity of health care.

	Nature	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	Positive	Regional	High	Long Term	Likely	3
After Mitigation	Positive	Regional	High	Long Term	Likely	3
Significance of Impact and Preferred Alternatives	Mitigation is not necessary for this positive impact.					

Environmental Feature	Impact owing to Land and Rights Acquisition
Relevant Alternatives & Activities	Acquisition of land
Project life-cycle	Pre-construction phase
Potential Impact	**Proposed Management Objectives / Mitigation Measures**
Siting conflicts between Solar PV infrastructure and existing buildings and properties	• It is recommended that the final location of the PV cells be adjusted to avoid such impacts. It is not desirable in communities of this nature, in vulnerable economic circumstances, to be relocated to make way for solar PV infrastructure. • Relocation in these circumstances would require the project proponent to restore the relocated households to a position equal or better that they were prior to the relocation. This does not only have to do with the restoration of physical property, but a restoration of their livelihood, and this may depend specifically upon the current location. [*Insert: As part of the Tripartite and Rehabilitation Agreement, the MLM is responsible for the removal of informal dwellings, as well as for relocating the people residing in the old mine houses*] • Special care should be taken with informal dwellings or household establishment. The authors recommend a best practise approach to relocation, which adhered to the guidelines offered by the International Finance Corporation.
Relocation of Households	• In the event that household relocation will be necessary, the process to be followed is as follows: ○ A Resettlement Action Plan to be drawn up providing detail on the impacted households, households needs and how these will be catered for during and after the relocation, provides detail on the area to which they are to be relocated and the timeframes associated with the relocation. ○ The Relocation Action Plan is to be discussed with every impacted household and agreed to in writing. ○ The Relocation Action Plan is to be discussed with every impacted landowner (if this is not the same as the impacted household) and agreed to in writing. ○ Relocation is to take place in strict accordance with the Relocation Action Plan. ○ An independent audit, carried out by a suitably qualified relocation expert, is to be conducted after every relocation to determine the relocation's effectiveness and to identify shortfalls in adhering to the relocation action plan. ○ Shortfalls are to be addressed by the Proponent within the duration of the construction period of the Project. [*Insert: As part of the Tripartite and Rehabilitation Agreement, the MLM is responsible for the removal of informal dwellings, as well as for relocating the people residing in the old mine houses*]
Construction Period and time frame	• Careful planning should be adopted to reduce the impact of land acquisition on the overall programme for the works.

	Nature	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**
Before Mitigation	Negative	Regional	High	Long term	likely	3
After Mitigation	Negative	Local	Low	Medium term	Likely	1
Significance of Impact and Preferred Alternatives	The avoidance of any buildings, infrastructure or impact on existing livelihoods is as a result of the positioning of the Solar PV panels and associated infrastructure are the primary mitigation measure that should be adopted. The final positioning					

	and site selection should be amended to avoid impacts on existing developments/infrastructure as far as possible. [*Insert: Note the following in terms of the Tripartite and Rehabilitation Agreement – (a) Harmony Gold Mining Company Ltd is responsible for all the surface disturbances on the mining areas which includes, all historical mining and prospecting activities; (2) The MLM is responsible for the removal of informal dwellings, as well as for relocating the people residing in the old mine houses. In addition, the vent shaft and sub-station at the Phase 1 Site are still operational and will remain, which has been catered for in the layout*]

Environmental Feature	Impacts generated from area lighting at night
Project life-cycle	Construction and operational phases
Potential Impact	Proposed Management Objectives / Mitigation Measures
Fugitive light which lights up the night sky	• Install area lighting with shields to reduce light emitted to the sky and to neighbours. • Install as few as possible lights. • Lighting should focus their radiance towards the property and not the settlements in close vicinity. • All area lights should be installed with timers or photoelectric cells to ensure they are only operational during night hours. • Where possible install area lighting linked to movement sensors, therefore the lights are only used when they are needed.

	Nature	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**
Before Mitigation	Negative	Regional	High	Long Term	Likely	3
After Mitigation	Negative	Local	Medium	Long Term	Likely	2
Significance of Impact and Preferred Alternatives	Impacts resulting from lighting can be controlled through the utilisation of technical measures.					

Environmental Feature	Economic opportunities arising from the construction phase
Project life-cycle	Construction phase
Potential Impact	**Proposed Management Objectives / Mitigation Measures**
SMME Creation	• Local SMMEs should be given an opportunity to participate in the construction of the project through the supply of services, material or equipment.
Job Creation and Skills Development	• The main contractor should employ non-core labour from the Main/Sub places as far as possible during the construction phase. • The principles of Expanded Public Works Programme can be used for guiding the construction.
Indirect Employment Impacts	• Spaza/informal trader shops may open next to the site as a consequence of construction. These should be controlled by the Contractor to limit their footprint and to ensure that the MLM's Informal Trading By-laws are complied with.

	Nature	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**
Before Mitigation	Positive	Local	Medium	Short Term	Likely	1
After Mitigation	Positive	Local	Low	Short Term	Likely	3

Significance of Impact and Preferred Alternatives	Individuals who will benefit during the construction are limited to those who actively participate in the construction activity through employment, sub-contracting or other economic opportunities. Active participation should be encouraged.

Environmental Feature	Disturbance arising from the construction phase
Project life-cycle	Construction phase
Potential Impact	**Proposed Management Objectives / Mitigation Measures**
Traffic	• Ensure that the necessary signage and traffic measures are implemented for safe and convenient access to the site. • Additional creation of routes and access roads must be implemented to reduce heavy traffic flow. • The EMPr must include restrictions on the Contractor and its sub-contractors related to minimising impacts on the safety of road users. Restrictions should include appropriate speed limitations, restricting travel times to daylight hours, communication measures and the establishment of haul routes. • Measures must be put in place to prevent construction vehicles from entraining dirt onto public roads. • Traffic control personnel must be assigned where deemed necessary. This will be to control the movement of construction vehicles in relation to local vehicles to ensure maximum safety and coherence.
Local Road Condition	• A continuous condition survey of the local roads to be used during the construction phase should be made prior to construction. • Delivery routes should be defined and adhered to during the construction phase. • Maintenance of local roads should take place during the construction phase, ensuring that the local roads used by the contractor are left in the same or better condition than they were prior to the start of construction.
Increase in Dust	• Dust and disturbance can be mitigated through the use of appropriate dust suppression mechanisms. • Adherence to road signage can be added as an advantage and a measure to manage the increase in dust levels.
Influx of workers	• All employment of locally sourced labour should be controlled on a contractual basis. If possible, and if the relevant Ward Councillors deem it necessary, the employment process should include the affected Ward Councillors. • People in search of work may move into the area, however, the Project will create a limited number of job opportunities. Locally based people should be given opportunities and preferences over others. • No staff accommodation should be allowed on site. • Influx of workers could may lead to increased diseases and HIV/AIDSs & STI as well as STD infections, therefore awareness programmes should be implemented through the local educational institutions and for the workers as well.
Worker Health and Safety	• The provisions of the OHS Act 85 of 1993 and the Construction Regulations of 2014 should be implemented on all sites. • Account should be taken of the safety impacts on the local community when carrying out the longitudinal aspects of the project, such as the power lines. • Contractors should establish HIV/AIDs awareness programmes at their site camps.
Security	• The site should be fenced for the duration of construction.

	• All contractors' staff should be easily identifiable through their respective uniforms. • A security policy should be developed which amongst others requires that permission be obtained prior to entering any property and provisions controlling trespassing by contractor staff. • Security staff should only be allowed to reside at contractor camps and no other employees. • Contractors should establish crime awareness programmes at their site camps.
Noise impacts	• Working hours to be agreed upon with Project Manager, so as to minimise disturbance to community members. • Should overtime work be required, that will generate noise, consultation with the affected community or landowner should take place.
Damage to property	• If a risk exists of damage taking place to a property as a result of construction, a condition survey should be undertaken prior to construction. • The Contractor is to make good and acknowledge any damage that occurs on any property as a result of construction work.

	Nature	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	Negative	Local	Medium	Short Term	Likely	2
After Mitigation	Negative	Local	Low	Short Term	Moderate	1
Significance of Impact and Preferred Alternatives	Disturbances and irritation during construction is to be expected. These can then be successfully mitigated through Contractor specifications that are issued at a tender stage and through the continuous monitoring during construction phase. Negative impacts owing to the construction will unfortunately be experienced irrespective of the site and routing alternative.					

13.26 "No-Go" Impacts

The "no-go option" is the alternative of not implementing the activity. The "no-go option" also provides the baseline against which the impacts of other alternatives are compared.

The "no go option" needs to be considered in light of the motivation (see **Section 3** above) as well as the need and desirability of the Project (see **Section 8** above). Some key considerations in this regard include:

- South Africa has identified the need to supply a diversified power generation that includes renewable energy technologies, such as proposed by the Project. This is in light of the country's endeavour and commitment to reduce the carbon footprint created by the current heavy reliance on coal to produce electricity;
- The Project will be developed to serve the MLM's energy requirements and will generate power for delivery to the local/national grid. The Project holds various benefits for MLM, including refinancing the current Eskom debt for immediate relief, potential to attract foreign investments, additional revenue stream, financial investment into the municipality and local economic benefits (e.g. job creation, skills development and SMME development);
- The Proponent has secured a long term lease with the MLM for the duration of the PPA. The MLM's Council has formally classified this Project as an EEPP; and

- Surplus power will be taken up by other C&I off-takers via additional PPA's.

In contrast, should the proposed Project not go ahead, any potentially significant environmental issues associated with the Project (refer to **Section 13.9** to **Section 13.25** above) would be irrelevant and the status quo of the local receiving environment would not be affected by the Project-related activities. Following the rehabilitation of the sites by Harmony Gold Mining Company Ltd., in terms of historical mining activities, the prerogative will lie with the MLM as the landowner to determine an alternative future desired use of the land (if any). The objectives of the Project would, however, not be met. This will *inter alia* mean that the Project's intended benefits to MLM will not be realised. The "no go option" is thus not preferred.

13.27 Cumulative Impacts

13.27.1 Introduction

A cumulative impact, in relation to an activity, means the past, current and reasonably foreseeable future impact of an activity, considered together with the impact of activities associated with that activity that in itself may not be significant, but may become significant when added to the existing and reasonably foreseeable impacts eventuating from similar or diverse activities.

13.27.2 Other Renewable Energy Projects in Proximity to the Proposed PV Sites

Cumulative impacts can be identified by combining the potential environmental implications of the Project with the impacts of projects and activities that have occurred in the past, are currently occurring, or are proposed in the future within the Project area. According to the REEA Database, renewable energy applications have been made for the properties to the immediate south and west of the Phase 1 Site and to the south-east of the Phase 2 Site.

One of these renewable energy projects (reference number 14/12/16/3/3/1/1471/AM1), which is located to the south of the Phase 1 Site, proposed the establishment of the Eland PV facility located within the boundary of properties owned by the Harmony Gold Mining Company Ltd near Odendaalsrus. The purpose of this project is to generate electricity for exclusive use by the mining company (Savannah Environmental, 2015).

Information pertaining to the other renewable energy project in the area could not be found.

From a desktop scan it can be seen that these other renewable energy project sites have also been affected by mining and other anthropogenic activities. Nonetheless, cumulative impacts may be caused by these various developments, including loss of biodiversity and habitat fragmentation, visual and landscape character impacts, noise, reduction in air quality, traffic disruptions, as well as pressures on local facilities, goods and services. The aforementioned impacts in relation to the Project have been assessed individually in **Section 13.9** to **Section 13.25** above and mitigation measures have been developed for each of the impact areas.

13.27.3 The Proposed Project's contribution towards Cumulative Impacts

The following is noted in terms of the Project's contribution towards cumulative impacts:

- The sensitivity of the Project area from an avifaunal perspective is discussed in **Section 12.5** above, and these sensitivities were taken into consideration in the revised layouts (see **Section 14** below). There is an opportunity to implement a combined avifauna monitoring programme for the various renewable energy projects. Such a programme will need to comply with the Birds and Solar Energy Best Practice Guidelines (Jenkins *et al*., 2017).
- The construction period may cause traffic-related impacts in terms of the local road network, which will be associated with heavy vehicle construction traffic for the delivery of material, transportation of construction workers and general construction-related traffic. This may compound traffic impacts if other large scale projects are planned during the same period. The EMPr includes mitigation measures to manage traffic-related impacts.
- The cumulative area of indigenous vegetation to be cleared for the entire Project (except linear components) is 682 Ha (Phase 1 = ± 358 Ha and Phase 2 = ± 325 Ha). The clearance of the vegetative cover over large areas associated with the Project's development footprint will exacerbate erosion, which is already encountered in the greater area as a result of other land use disturbances. Mitigation measures to control erosion are included in the EMPr.
- There will be an increase in the dust levels during the construction phase, as a result of earthworks, use of haul roads and other gravel roads, stockpiles, material crushing, etc. Measures to manage dust are included in the EMPr.
- Any developments that may be enabled by the proposed Project may place a strain on the infrastructure of Odendaalsrus. The future growth of the town and interventions to ensure that the infrastructure can cater for this growth forms part of municipal planning, which includes the IDP and SDF.
- Changes in demographics in the region due to the influx of employment seekers may cause problems such as crime, STDs, conflicts with local communities, etc. This was assessed as part of the Socio-economic Impact Assessment and mitigation measures are included in the EMPr.
- There is a potential for positive cumulative economic effects from the construction of multiple developments in the area. The increased creation of jobs and economic input into local businesses would provide a benefit to local communities.

14 ANALYSIS OF ALTERNATIVES

14.1 General

Alternatives are the different ways in which a project can be executed to ultimately achieve its objectives. Examples could include carrying out a different type of action, choosing an alternative location or adopting a different technology or design for the project.

By conducting the comparative analysis, the BPEO can be selected with technical and environmental justification. Münster (2005) defines BPEO as the alternative that "*provides the most benefit or causes the least damage to the environment as a whole, at a cost acceptable to society, in the long term as well as in the short term*".

14.2 "No-Go" Option

The implications of the "no-go" option are discussed in **Section 13.26** above.

The "no go option" is not preferred, as the objectives of the Project will not be met, and the associated benefits will not materialise. Although not proceeding with the Project would avoid the adverse environmental impacts, these impacts are considered to be manageable through the provisions contained in the EIA Report and EMPr.

14.3 Layout Alternatives

The original Project layout, referred to as Layout Alternative A (shown in **Figures 3 – 5** above), was assessed by the specialists (**Section 12.3** to **Section 12.12**). This layout included the following options to the proposed Phase 1 and Phase 2 PV Sites with BESS:

- Phase 1 –
  - Two options were considered for the location of the Phase 1 BESS, based on two options identified for the substation position. Option 1 is located on the south-western portion of the Phase 1 Site and Option 2 is located further north and more central on the site (shown in **Figure 104** below);
- Phase 2 –
  - It was proposed to realign the A48 / S86 road that crosses the western part of the Phase 2 Site to maximise the space available on the property to install solar tracker rows and enable the solar farm to be fenced off and secured. Two options were proposed to realign the road, as shown in **Figure 17** above.

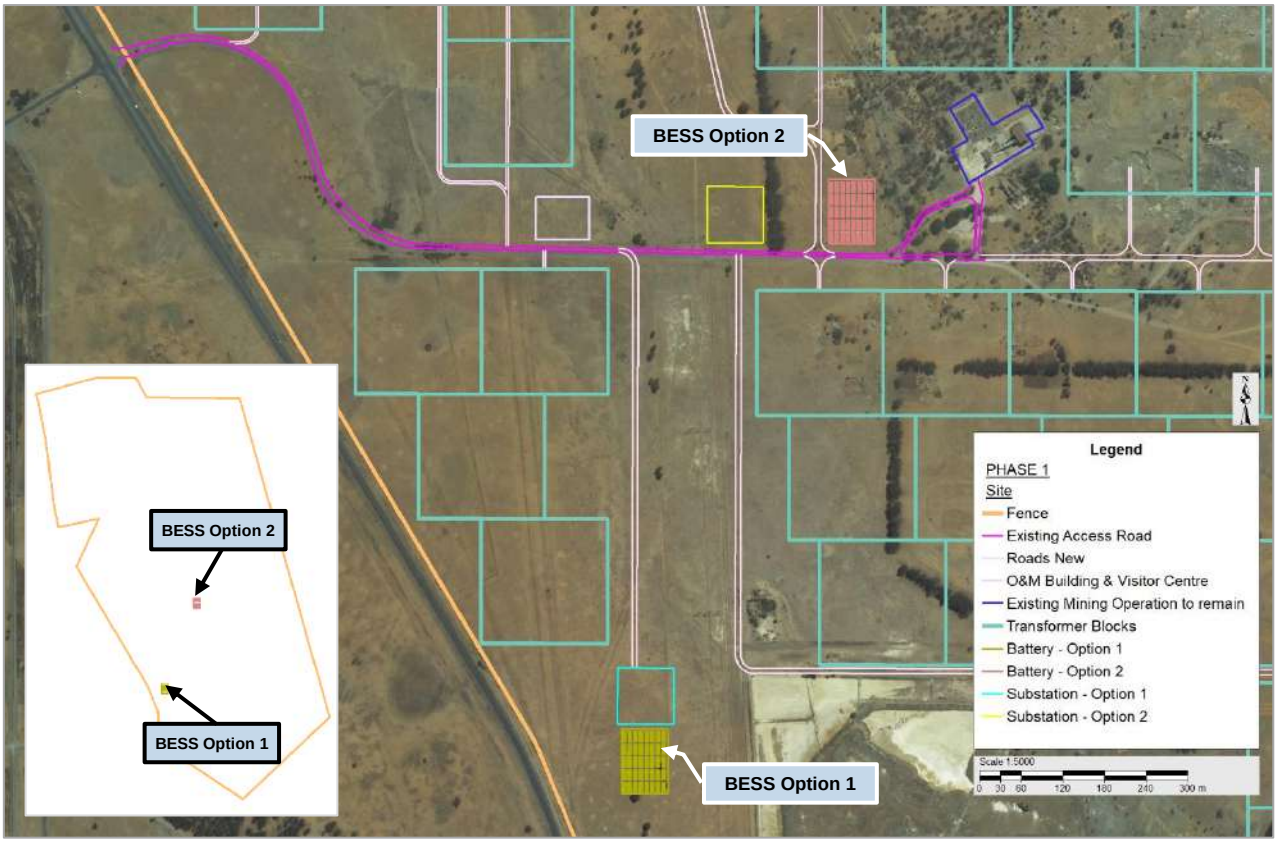


Figure 104: BESS location options

Based on the findings of the specialist studies, in particular the Water Resources Impact Assessment, Terrestrial Ecology Assessment, Avifaunal Assessment and Traffic Impact Assessment, the layouts for the Phase 1 and Phase 2 PV Sites were revised to cater for the environmental sensitivity, with associated changes to the power lines and substations. This new layout is referred to as Layout Alternative B.

The following key changes were made in Layout Alternative B (refer to **Figure 105** and **Figure 106** below):

- Phase 1 –
  - The transformer blocks and ancillary infrastructure were reconfigured to avoid areas of "very high" sensitivity;
- Phase 2 –
  - The transformer blocks and ancillary infrastructure were reconfigured to avoid areas of "very high" sensitivity;
  - The proposed realignment of the A48 / S86 was discarded; and
  - The south-eastern portion of the eastern block was discarded.

There were thus two alternatives that were ultimately assessed to identify the BPEO, namely Layout Alternatives A and B, as well as the Phase 1 BESS Options 1 and 2.

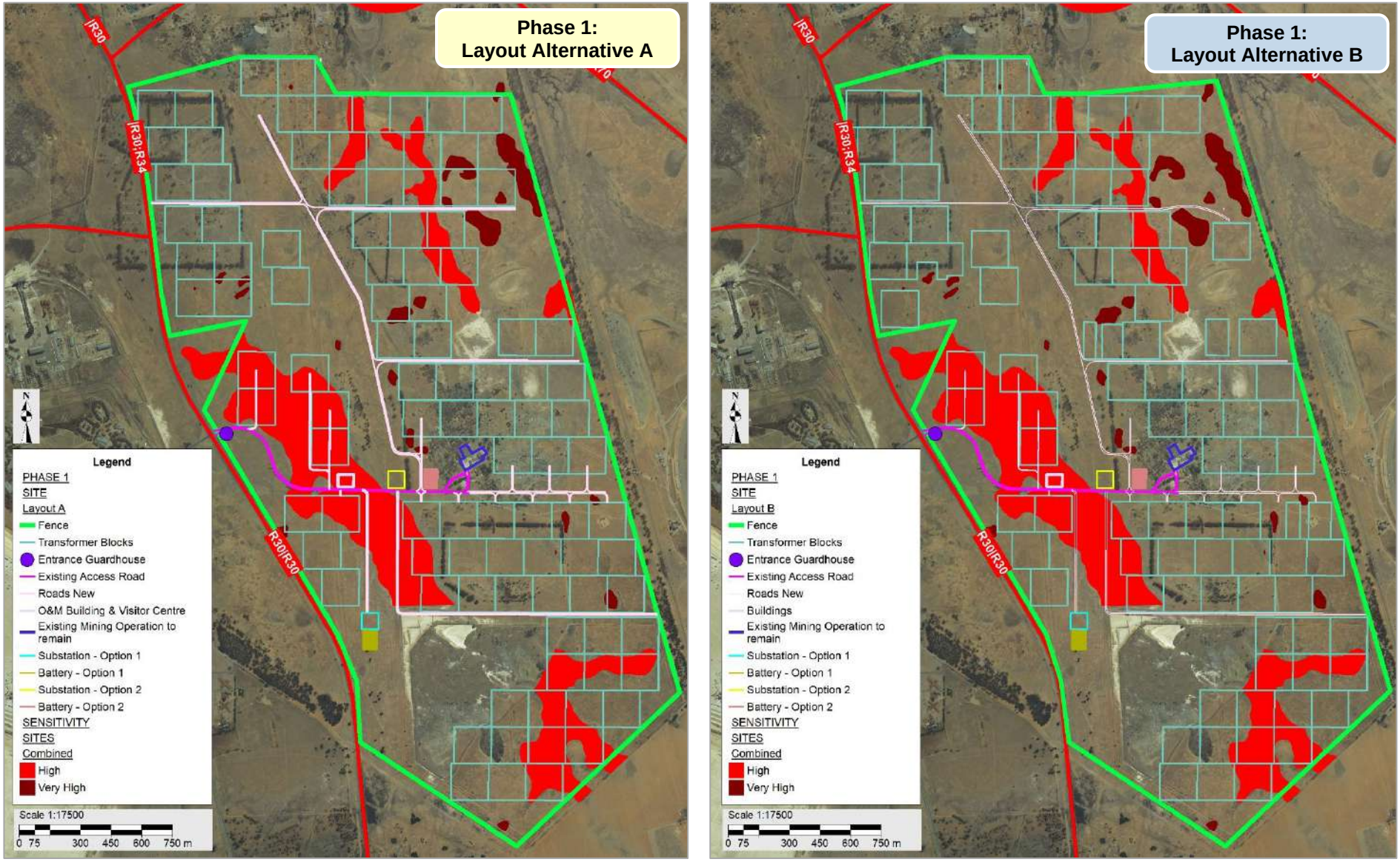


Figure 105: **Comparison of alternative layouts for Phase 1 Site (based on sensitivity)**

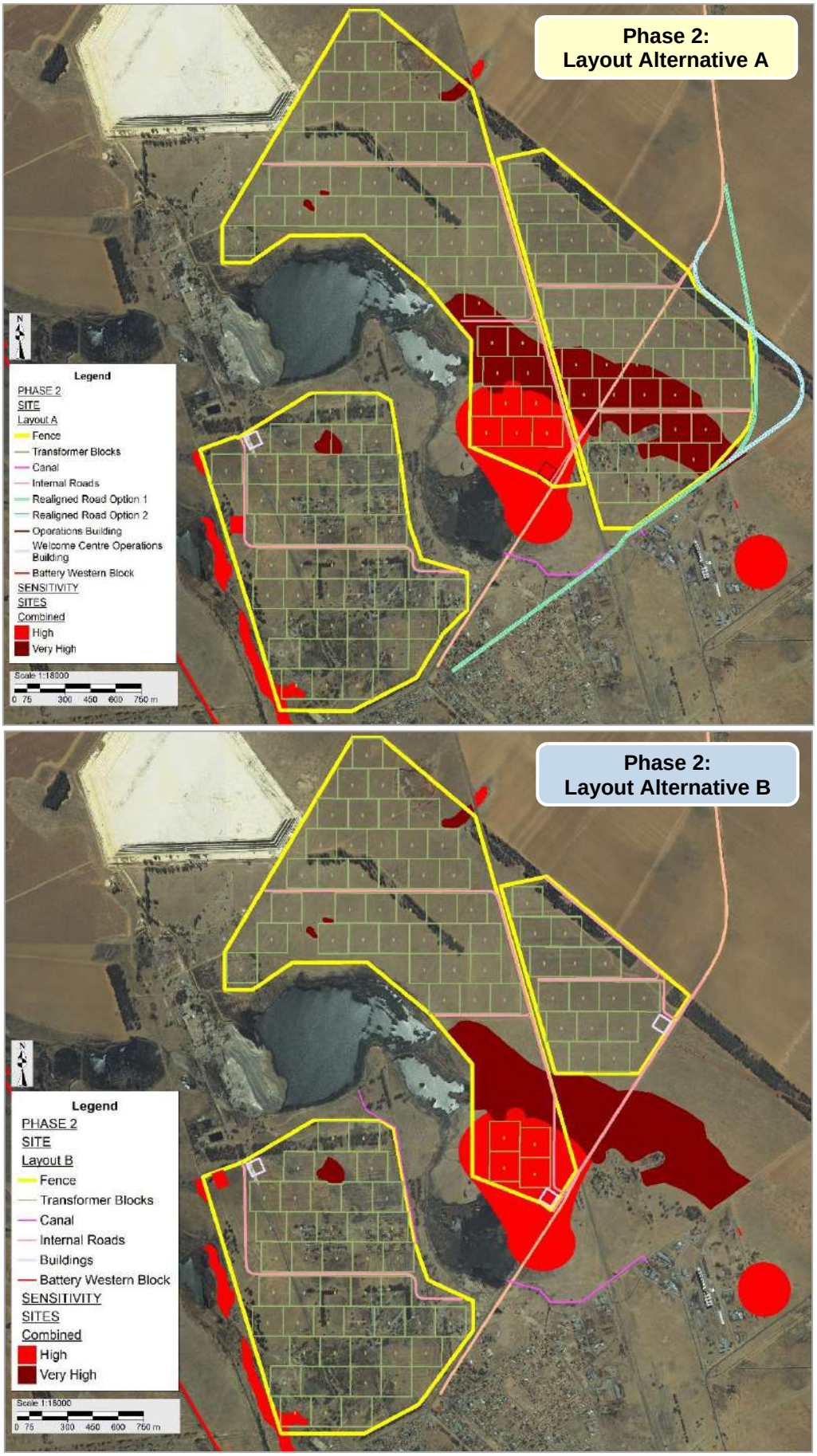


Figure 106: Comparison of alternative layouts for Phase 2 Sites (based on sensitivity)

14.4 Preferences Expressed by Specialists & Technical Team

14.4.1 Layout Alternatives A and B

As mentioned in **Section 14.3** above, Layout Alternative B was compiled based on the findings of the Water Resources Impact Assessment, Terrestrial Ecology Assessment, Avifaunal Assessment and Traffic Impact Assessment. The findings of the other specialist studies did not necessitate any changes to the original layout (Layout Alternative A).

14.4.2 Phase 1 BESS Options 1 and 2

The preferences expressed by the specialists and technical team in terms of the Phase 1 BESS Options 1 and 2 are provided in **Table 51** below.

Table 51: Summary of Options preferred by specialists and technical team
(✓ = preferred; grey fil & - = no preference expressed)

Project Phase	Alternatives	Terrestrial Ecology	Aquatic	Avifauna	Agriculture	Heritage	Palaeontology	Socio-Economic	Visual	Technical
Phase 1	BESS Option		-		-	-	-	-	-	✓
	BESS Option 2	✓		✓						

The Phase 1 BESS Option 2 was identified as the preferred alternative in the Terrestrial Ecology Assessment and Avifaunal Assessment, as this option negates the need for an additional road that would have been required to access the Substation Option 1 Site. However, the impacts associated with the additional road can be suitably managed by the mitigation measures provided.

From a technical (engineering) perspective, the Phase 1 Substation Option 1 is the preferred position, as it will lead to less shading of the solar PV panels by the transmission lines and substation and the associated power line to Euclid Substation will be shorter (refer to separate Basic Assessment Report for the Phase 1 and Phase 2 Power Lines and Substations). Hence, the Phase 1 BESS Option 1 site is also preferred, as it will be located adjacent to the substation. The Substation Option 2 Site is located further north and more central in the Phase 1 PV Site, and has the advantage of shorter 33kV cables lengths.

The others specialist studies did not express any preferences in terms of the Phase 1 BESS Options.

14.5 BESS Technology Alternatives

The BESS can be broken into solid state and flow battery systems. Refer to **Section 9.6** above for the advantages and disadvantages associated with the types of BESS. A single battery technology, or a combination of two or more technology alternatives, may be implemented for the Project. The preferred BESS technology will only be identified during the design phase.

14.6 BPEO

Based on the recommendations of the specialists, technical considerations and the comparison of the impacts, the following options were collectively identified as the BPEO:

- Layout – Layout Alternative B; and
- Phase 1 BESS – Option 1.

Layout diagrams of the BPEO for Phase 1 and Phase 2 are shown in **Figure 107** and **Figures 108** below, respectively.

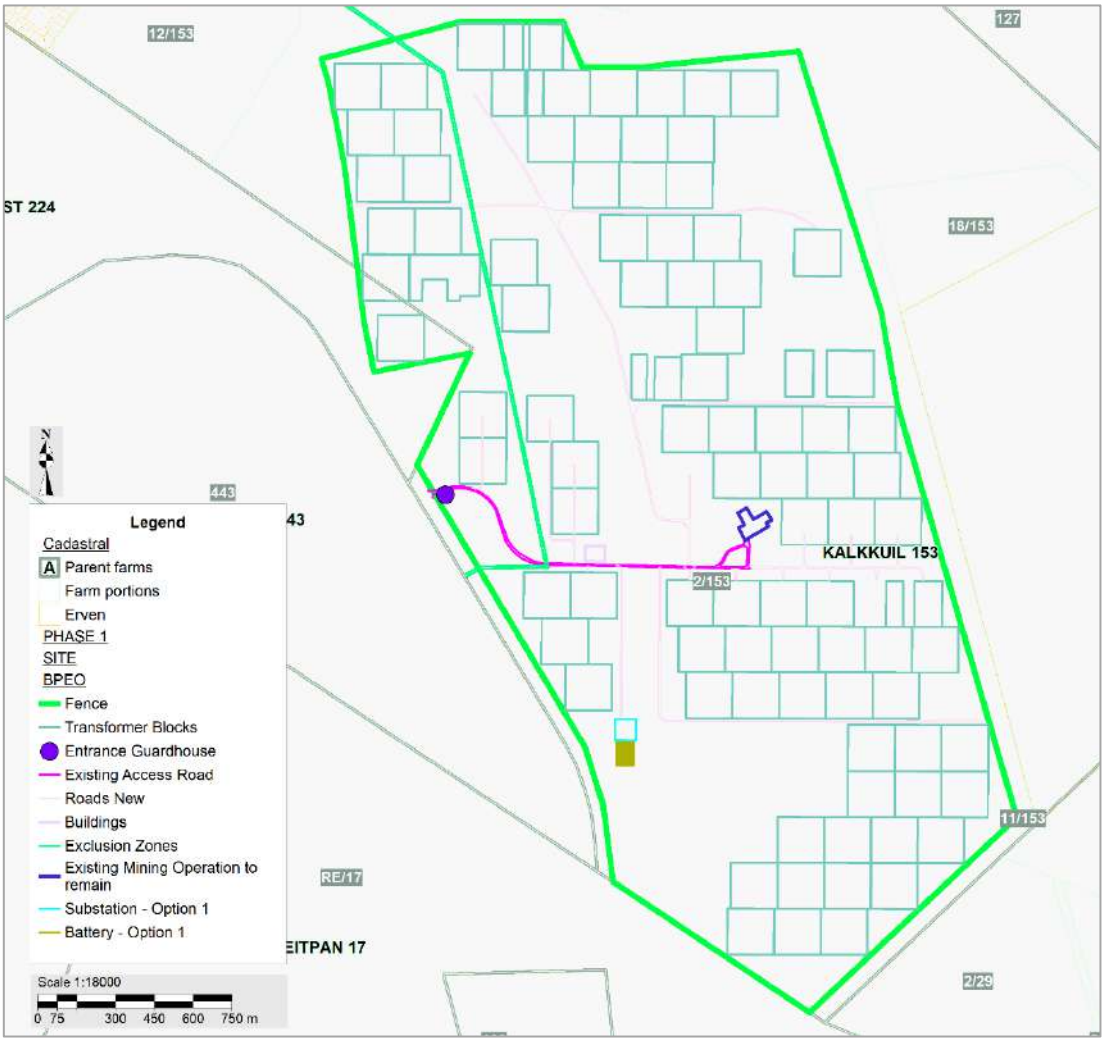


Figure 107: Layout of BPEO for Phase 1

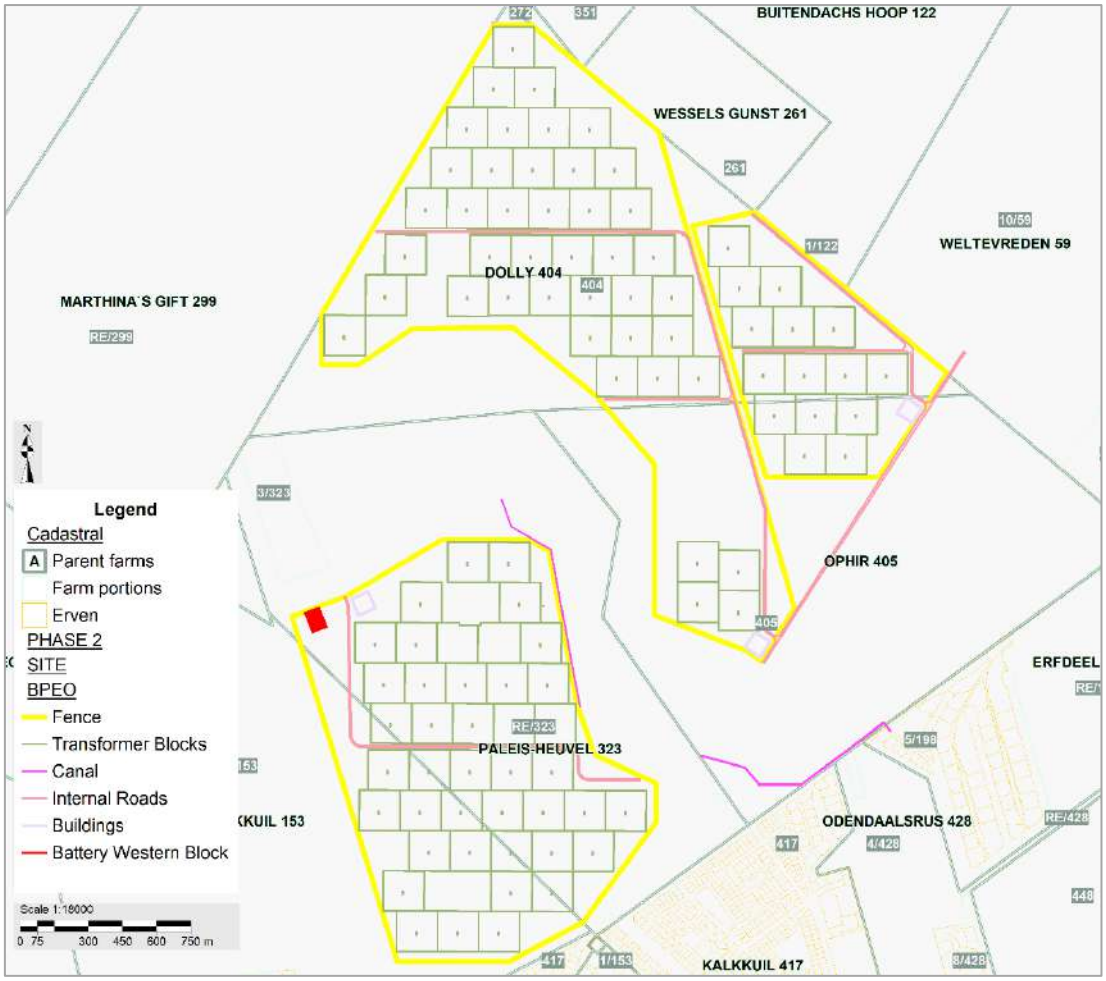


Figure 108: Layout of BPEO for Phase 2

The BPEO provides a balance between technological, energy and environmental aspects, while retaining the flexibility required in the final design stage of the Project.

15 PUBLIC PARTICIPATION

15.1 General

The purpose of public participation includes the following:

1. To provide IAPs with an opportunity to obtain information about the Project;
2. To allow IAPs to express their views, issues and concerns with regard to the Project;
3. To grant IAPs an opportunity to recommend measures to avoid or reduce adverse impacts and enhance positive impacts associated with the Project; and
4. To enable the Applicant to incorporate the needs, concerns and recommendations of IAPs into the Project, where feasible.

The public participation process that was followed for the proposed Project is governed by NEMA and GN No. R 982 of 4 December 2014 (as amended). **Figure 109** below outlines the public participation process for the current EIA Phase.

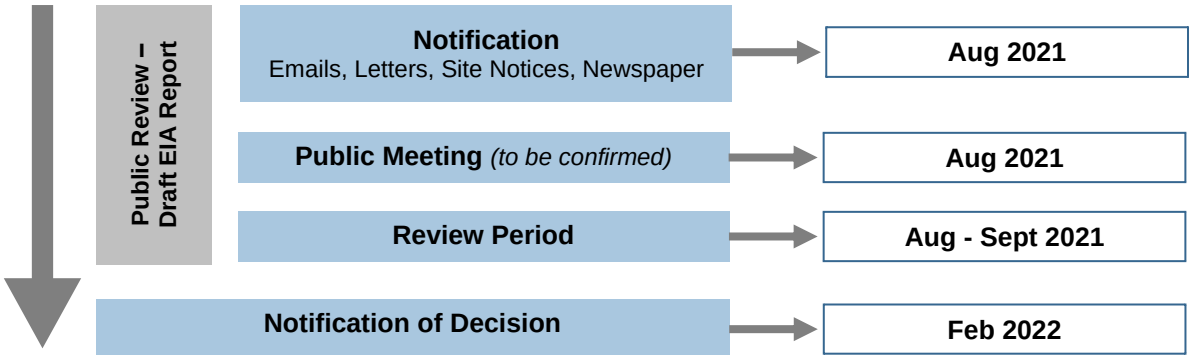


Figure 109: Outline of Public Participation Process for EIA Phase

15.2 Public Participation during the Scoping Phase

The primary tasks undertaken as part of public participation during the Scoping Phase included the following (details provided in the Scoping Report):

1. Compiling a database of IAPs;
2. Notifying IAPs of the review of the Draft Scoping Report by erecting onsite notices, placing newspaper notices, forwarding emails to IAPs on the database and distributing letters to properties that form part of the Odendaalsrus Town, which are located to the north of the Phase 1 Site and to the south of the Phase 2 Site.
3. Granting IAPs and authorities an opportunity to review the Draft Scoping Report; and
4. Compiling and maintaining a Comments and Responses Report.

15.3 Public Participation during the EIA Phase

15.3.1 Adherence to the National State of Disaster declared for the COVID-19 Pandemic

The Minister of Environment, Forestry and Fisheries published the Directions regarding measures to address, prevent and combat the spread of COVID-19 relating to National Environmental Management Permits and Licences in Government Notice No. 650 of 5 June 2020.

A Public Participation Plan for the review of the Draft EIA Report was compiled in terms of the abovementioned Directions, which was submitted to DFFE and subsequently approved.

15.3.2 Maintenance of the I&AP Database

A database of IAPs (refer to **Appendix I**), which includes authorities, different spheres of government (national, provincial and local), parastatals, stakeholders, landowners, interest groups and members of the general public, was maintained during the EIA phase.

15.3.3 Period to Review the Draft EIA Report

In accordance with Regulation 43(1) of GN No. R 982 of 4 December 2014 (as amended), IAPs are granted an opportunity to review and comment on the Draft EIA Report from **16 August until 16 September 2021**.

15.3.4 Notification of Review of Draft EIA Report

The following notifications were provided with regards to the review of the Draft EIA Report:

- Site notices were erected at places conspicuous to and accessible by the public within the project footprint;
- A notice was placed in the Vista Newspaper; and
- IAPs were notified via email.

Proof of notification will be provided in the Final EIA Report.

15.3.5 IAPs' Access to the Draft EIA Report

A Copy of the Draft EIA Report was placed at the Odendaalsrus Public Library. The Draft EIA Report was also uploaded to the following website, for downloading purposes - https://nemai.co.za/environmental/downloadable-documents/.

15.3.6 Copies of Draft EIA Report to Authorities

Copies of the Draft EIA Report were provided to the following regulatory and commenting authorities:

- DFFE;

- DESTEA;
- DWS Free State Regional Office;
- DPRT;
- FSHRA;
- DMRE;
- LDM and MLM.

15.3.7 Public Meeting to Present the Draft EIA Report

Anyone that has an interest in attending a virtual public meeting will need to inform Nemai Consulting in writing by 23 August 2021 and will need to provide an email address. Only pre-registered parties that confirmed interest will receive an invitation to the public meeting.

15.3.8 Adherence to COVID-19-related Requirements

All IAPs accessing hardcopy of the Draft EIA Report will need to comply with the prevailing COVID-19-related protocols and requirements.

15.3.9 Commenting on the Draft EIA Report

Comments on the Draft EIA Report need to be forwarded in writing to the EAP. A Comment Sheet is provided in **Appendix M**, which may be used to provide comments.

CONTACT DETAILS OF EAP:

Contact Person:	*Donavan Henning*
Tel:	*(011) 781 1730*
Fax:	*(011) 781 1731*
Email:	*donavanh@nemai.co.za*
Postal Address:	*PO Box 1673, Sunninghill, 2157*

15.3.10 Comments Received on the Draft EIA Report

Comments received from authorities and IAPs during the review period for the Draft EIA Report will be included in the Comments and Responses Report, which will be appended to the Final EIA Report.

15.4 Notification of DFFE Decision

Registered IAPs will be notified after having received written notice from DFFE (in terms of NEMA) on the final decision for the Project. The notification will include the appeal procedure to the decision and key reasons for the decision.

16 EIA CONCLUSIONS

16.1 Outcomes of the EIA Phase

The following key tasks were undertaken during the EIA phase for the proposed Project:

- The specialist studies identified in the Plan of Study for the EIA were undertaken and the findings were incorporated into the EIA Report in terms of understanding the environmental status quo and sensitive features, assessing the potential impacts and establishing concomitant mitigation measures, as well as identifying the preferred alternatives;
- Potentially significant impacts pertaining to the pre-construction, construction and operational phases of the Project were identified and assessed, and mitigation measures were provided; and
- Alternatives for achieving the objectives of the proposed activity were considered, and the BPEO was identified. The “no-go” option is not supported when considering the implications of not implementing the Project.

The outcomes of these tasks are captured below.

16.2 Sensitive Environmental Features

The following sensitive and significant environmental features and aspects that are associated with the Project and its receiving environment are highlighted, for which mitigation measures are included in the EIA Report and EMPr:

- Wetlands were identified and delineated for the Phase 1 and Phase 2 Sites, and a waterlogged area was also identified at the Phase 2 Site.
- According to the Free State Biodiversity Conservation Plan, the proposed Project footprint encroaches into the following areas -
  - Phase 1 Site – ESA 1, ESA2 and CBA1; and
  - Phase 2 Site – ESA 1, ESA2 and CBA1.
- Fauna and flora SCC are present at both the PV Sites. Several individuals of four plant species that are protected by the Free State Nature Conservation Ordinance 8 of 1969 were observed in various parts of the Project area, especially the degraded grassland of the Phase 1 Site. A single Camel Thorn (*Vachellia erioloba*) was observed at the Phase 1 Site (location: 27°53'52.73"S and 26°42'05.24"E) and this tree must not be harmed unless a permit to do so has been obtained in terms of the NFA.
- Areas of avifaunal sensitivity for both Phase 1 and Phase 2 Sites were based on a combination of selected wetland delineation data, as deemed important for avifauna, as well as abundance data on congregations of collision prone species. The wetlands / watercourses deemed important for avifauna were assigned a very high importance rating.
- Soils are encountered on the Phase 1 and Phase 2 Sites that are prone to erosion.
- Radiological sources are present at both the PV Sites.

- Current informal uses of the PV Sites, including the grazing of livestock and informal settling, as well as people still residing within the old mining houses.
- Mining infrastructure (vent shaft and sub-station) that is still operational and that will remain on the Phase 1 Site.
- The surrounding road network, including the R30, R34, S289, A48 / S86, as well as affected roads and streets in the Odendaalsrus Urban Area.
- Existing infrastructure that traverses / is in close proximity to the PV Sites, including a regional railway line, water pipeline, power lines and a furrow / canal.
- From a cultural heritage perspective, a burial site (27°50'30.22"S and 26°41'37.17"E) and structures older than 60 years (27°51'23.11"S and 26°40'39.89"E) (occupied dwellings at Txolwene compound) were identified at the Phase 2 Site.

Combined sensitivity maps of the BPEO for the Phase 1 and Phase 2 Sites are shown in **Figure 110** and **Figure 111** below, respectively. Key environmental features that contributed toward the sensitive areas shown in these maps included wetlands, general terrestrial ecological habitats and avifauna habitats, as determined by the respective specialist studies.

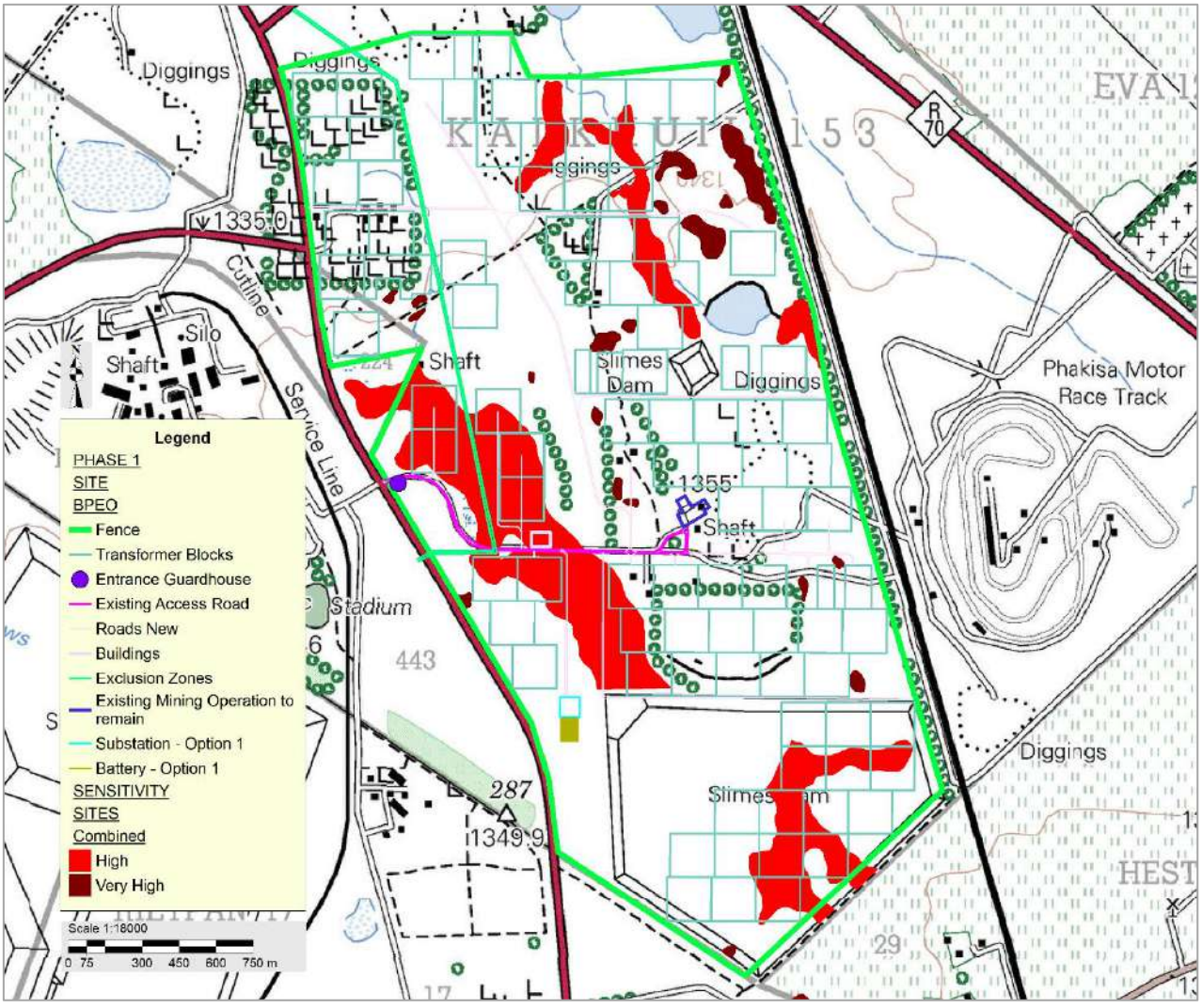


Figure 110: Phase 1 Site combined sensitivity map

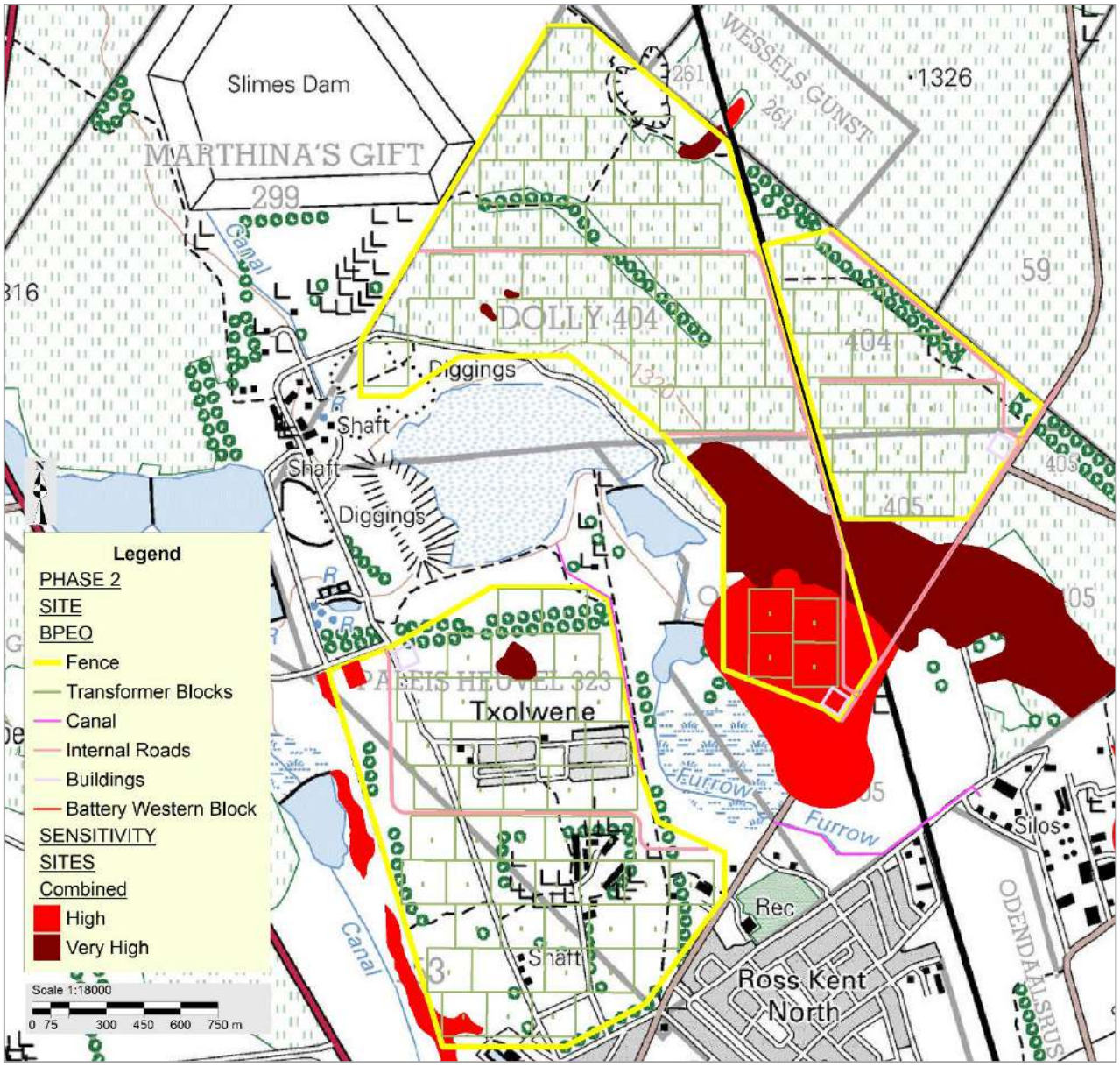


Figure 111: Phase 2 Site combined sensitivity map

16.3 Environmental Impact Statement

The Project's strategic intent is linked to the South African Government's pursuit of promoting the country's renewable energy development imperatives, which encourages the role of Independent Power Producers (IPPs) to feed into the national grid.

The rationale for the siting of the Project is based on its suitable geographic location, including the area's high solar yield area, flat topography, sparsely populated land, grid connection, water supply, good transport infrastructure and the availability of a large portion of municipal land, as well as the intended value that the Project will provide to MLM and users of electricity/energy. The proposed

Project Sites have been secured and the MLM has entered into a Long-Term Land Lease Agreement with the Applicant.

The potentially significant environmental impacts were investigated through the relevant specialist studies. Key findings from the EIA, apart from the sensitive environmental features and aspects listed in **Section 16.2** above, which may also influence the conditions of the Environmental Authorisation (if granted), include the following:

- The Water Resources Impact Assessment found that the loss of wetland areas (particularly at the Phase 1 Site) cannot be effectively mitigated, and in accordance with the mitigation hierarchy some form of compensation would be required. Compensation could include the rehabilitation of unaffected systems in the local area.
- It is crucial that the activities contained in the Tripartite and Rehabilitation Agreement between Harmony Gold Mining Company Ltd, MLM and the Applicant be implemented, including the rehabilitation of areas affected by mining activities. The scheduling of these activities is also crucial for the implementation of the Project.
- According to the Radiological Survey, radioactive tailings present on the PV Sites will need to be removed, which links to the rehabilitation activities to be undertaken by the Harmony Gold Mining Company Ltd. A follow-up survey is to be undertaken once the tailings material has been removed to verify that the activity concentrations in the respective areas are below 0.5 Bq/g. In addition, the proposed development of the PV Sites will need to adhere to all requirements of the NNR.
- From a bird perspective, it was recommended by the Avifaunal Specialist that the development of Phase 2 proceed in phases, where the decision to develop this site should be informed by at least one year of bird monitoring on the Phase 1 Site. If the bird monitoring carcass search data from the Phase 1 Site do not suggest that collisions are a significant impact, then the western block can be developed first, followed by the eastern block. With repeated monitoring and analysis of mortalities, a decision can be made with regards to the development of the northern block.
- The necessary permits will need to be obtained if the graves are to be relocated and the structures older than 60 years are to be demolished at the Phase 2 Site.
- Should archaeological sites or graves be exposed in other areas during construction work, it must immediately be reported to a heritage practitioner so that an investigation and evaluation of the finds can be made.
- The recommendations from the Traffic Impact Assessment in terms of gaining access to the Phase 2 Site's eastern and northern blocks, need to be complied with.
- The Layout Alternative A was revised to avoid areas with very high sensitivity ratings, based on the findings of the specialist studies. The evolved layout, which was termed Layout Alternative B, was determined to be the BPEO, together with the Phase 1 BESS Option 1.
- A detailed risk assessment will need to be undertaken based on the type of BESS technology selected and the final design of the Solar PV Plant. The outcomes of this risk assessment will need to be incorporated into the Operational EMPr.

- Suitable measures need to be implemented to prevent erosion, manage site drainage and rehabilitate cleared areas during the project life-cycle.

The Project is considered to be compatible with existing land uses encountered in the area. The impacts and risks assessed as part of the EIA process that was undertaken for the Project are considered manageable with the effective implementation of the measures stipulated in this EIA Report and EMPr.

With the selection of the BPEO, the adoption of the mitigation measures included in the EIA Report and the dedicated implementation of the EMPr, it is believed that the significant environmental aspects and impacts associated with this Project can be suitably mitigated. With the aforementioned in mind, it can be concluded that there are no fatal flaws associated with the Project and that authorisation can be issued, based on the findings of the specialists and the impact assessment, through the compliance with the identified environmental management provisions.

It is further the opinion of the EAP and EIA team that the EIA was executed in an objective manner and that the process and EIA Report conform to the requirements stipulated in the EIA Regulations of 2014 (as amended).

17 REFERENCES

ADU, 2020. Virtual Museum. ADU (Animal Demography Unit). (Accessed: November 2020).

Airshed, 2015. Air Quality Impact Assessment for the Jeanette Project. Airshed Planning Professionals (Pty) Ltd, Johannesburg, South Africa.

Arup, 2018. Darlington Point Solar Farm Preliminary Hazard Assessment. Arup Pty Ltd, Australia.

Banzai Environmental, 2020. Palaeontological Desktop Assessment for the Proposed Matjhabeng Solar PV with Battery Energy Storage Systems Project: Phase 1 and Phase 2 Sites, Odendaalsrus, Free State. Banzai Environmental, Bloemfontein, South Africa.

BGIS, 2018. BGIS (Biodiversity GIS). http://bgis.sanbi.org/ (Accessed: November 2020).

Brownlie, S., 2005. Guideline for involving biodiversity specialists in EIA processes: Edition 1. CSIR Report No ENV-S-C 2005 053 C. Republic of South Africa, Provincial Government of the Western Cape, Department of Environmental Affairs & Development Planning, Cape Town, South Africa.

Butler, R., 2013. Managing the lithium (ion) battery fire risk, accessed online from http://www.hemmingfire.com/news/fullstory.php/aid/1790/Managing_the_lithium__ion__battery_fire_risk.html.

CAR, 2020. Coordinated Avifaunal Roadcounts (CAR). http://car.birdmap.africa/index.php (Accessed: November 2020).

Chang, G.J., & Jennings, C., 1994. Magnetic Field Survey at PG&E Photovoltaic Sites, accessed October 2017, from http://www.osti.gov/bridge/servlets/purl/82309-WOEtJb/webviewable/82309.pdf.

Collins, N.B., 2016. Free State Province Biodiversity Plan: Technical Report v1.0. Free State Department of Economic, Small Business Development, Tourism and Environmental Affairs. Internal Report. Free State Department of Economic, Small Business Development, Tourism and Environmental Affairs, Bloemfontein, South Africa.

DEA, 2010. Public Participation 2010. Integrated Environmental Management Guideline Series 7. Department of Environmental Affairs (DEA), Pretoria, South Africa.

DEA, 2015. EIA Guideline for Renewable Energy Projects. Department of Environmental Affairs (DEA), Pretoria, South Africa.

DEA&DP, 2010a. Guideline on Alternatives, EIA Guideline and Information Document Series. Western Cape Department of Environmental Affairs & Development Planning (DEA&DP), Cape Town, South Africa.

DEA&DP, 2010b. Guideline on Need and Desirability, NEMA EIA Regulations Guideline and Information Document Series. Western Cape Department of Environmental Affairs & Development Planning (DEA&DP), Cape Town, South Africa.

Department of Energy, 2017. State of Renewable Energy in South Africa. Department of Energy, Pretoria, South Africa.

DME, 2006. National Safety Standards and Regulatory Practices, Regulation 388, Revision 0, Government Gazette No. 28755, Vol. 490: Department of Minerals and Energy (DME), Pretoria, South Africa.

DWAF, 2005. A practical field procedure for identification and delineation of wetlands and riparian areas. Department of Water Affairs and Forestry (DWAF), Pretoria, South Africa.

Energy Storage Council, 2016, Battery storage systems: what are their chemical hazards?, accessed 22 November 2017 from https://energystoragealliance.com.au/category/safety/.

Index, 2020. Agricultural Impact Assessment. Solar Photovoltaic Plant of the Proposed Matjhabeng Solar PV with Battery Energy Storage Systems Project, Free State Province. Index, Pretoria, South Africa.

IUCN, 2017. The IUCN Red List of Threatened Species. www.iucnredlist.org (Accessed: November 2020).

Jeffares & Green, 2016. Matjhabeng Solar Park. Geotechnical Report. Jeffares & Green, Johannesburg, South Africa.

Jenkins, A.R., Ralston-Paton, S. & Smit-Robinson, H.A., 2017. Birds and Solar Energy. Best Practice Guidelines. Guidelines for Assessing and Monitoring the Impact of Solar Power Generating Facilities on Birds in Southern Africa. BirdLife South Africa, Johannesburg, South Africa.

JIS Environmental Engineers, 2019. Scoping Report for the Proposed Construction of the Matjhabeng 450 MW PV Solar Park in Odendaalsrus, Free State Province: DEA Ref No: 14/12/16/3/2/1097. JIS Environmental Engineers, Pretoria, South Africa.

Keatimilwe, K. & Ashton, P.J., 2005. Guideline for the Review of Specialist Input into the EIA. Process: Edition 1. CSIR Report No ENV-S-C 2005 053 B. Provincial. Government of the Western Cape, Department of Environmental Affairs & Development Planning, Cape Town, South Africa.

KMA Consulting Engineers, 2020. Matjhabeng Pv Solar Power Plant Traffic Impact Assessment. KMA Consulting Engineers. Bloemfontein, South Africa.

Lochner, P., 2005. Guideline for Environmental Management Plans. CSIR Report No ENV-S-C 2005-053 H. Republic of South Africa, Provincial Government of the Western Cape, Department of Environmental Affairs & Development Planning, Cape Town, South Africa.

Matjhabeng Local Municipality, 2019. 2019 - 2020 Integrated Development Plan. Matjhabeng Local Municipality, Welkom, South Africa.

MetroGIS, 2015. Proposed Matjhabeng Photovoltaic (PV) Project, Free State Province. Visual Assessment - Input for Scoping Report. MetroGIS (Pty) Ltd, Pretoria, South Africa.

Mucina, L. & Rutherford, M.C. (Eds.), 2006. The vegetation of South Africa, Lesotho and Swaziland. Strelizia 19. South African National Biodiversity Institute, Pretoria South African.

Münster, F., 2005. Guideline for determining the scope of specialist involvement in EIA processes: Edition 1. CSIR Report No ENV-S-C 2005 053 A. Republic of South Africa, Provincial Government of the Western Cape, Department of Environmental Affairs & Development Planning, Cape Town, South Africa.

Nel, J.L., Murray, K.M., Maherry, A.M., Petersen, C.P., Roux, D.J., Driver, A, Hill, L., Van Deventer, H., Funke, N., Swartz, E.R., Smith-Adao, L.B., Mbona, N., Downsborough, L. & Nienaber, S., 2011. Technical Report for the National Freshwater Ecosystem Priority Areas project. WRC Report No. K5/1801.

Nemai Consulting, 2020. Socio Economic Impact Assessment for the Proposed Matjhabeng Solar PV with Battery Energy Storage System Project: Phase 1 and Phase 2 PV Sites. Nemai Consulting, Johannesburg, South Africa.

Oberholzer, B., 2005. Guideline for involving visual & aesthetic specialists in EIA processes: Edition 1. CSIR Report No. ENV-S-C 2005 053 F. Republic of South Africa, Provincial Government of the Western Cape, Department of Environmental Affairs & Development Planning, Cape Town, South Africa.

Ollis, D.J., Snaddon, C.D., Job, N.M. & Mbona, N., 2013. Classification System for Wetlands and other Aquatic Ecosystems in South Africa. User Manual: Inland Systems. SANBI Biodiversity Series 22. South African Biodiversity Institute, Pretoria, South Africa.

Robb, L.J., & Robb, V.M., 1998. Gold in the Witwatersrand Basin. In Wilson, M.G.C. & Anhaeusser, C.R. (eds.) The Mineral Resources of South Africa. Sixth Edition. Handbook 16. Pretoria: Council for Geosciences.

SANBI, 2017. Technical guidelines for CBA Maps: Guidelines for developing a map of Critical Biodiversity Areas & Ecological Support Areas using systematic biodiversity planning. Driver, A., Holness, S. & Daniels, F. (Eds). 1st Edition. South African National Biodiversity Institute (SANBI), Pretoria, South Africa.

SAS, 2020. Visual Impact Assessment as part of the Environmental Assessment and Authorisation Process for the Proposed Matjhabeng 400 MW Solar Photovoltaic (PV) Plant with 80 MW (320 MWh) Battery Energy Storage System (BESS) Project, Odendaalsrus, Free State Province. Scientific Aquatic Services (SAS), Johannesburg, South Africa.

Savannah Environmental, 2015. Proposed Harmony Eland PV Solar Facility, Free State Province (DEA Ref. 14/12/16/3/3/1/1471). Final Basic Assessment Report. Savannah Environmental, Johannesburg, South Africa.

SciRAD Consulting, 2015. Interim Report on the Radiological Survey Performed at the Proposed Sunelex Sites near Odendaalsrus. SciRAD Consulting, Hartbeespoort, South Africa.

SciRAD Consulting, 2020. Report on the Radiological Status of the Proposed SunElex Sites near Odendaalsrus. SciRAD Consulting, Hartbeespoort, South Africa.

Skowno, A.L., Raimondo, D.C., Poole, C.J., Fizzotti, B. & Slingsby, J.A. (eds.), 2019. South African National Biodiversity Assessment 2018 Technical Report Volume 1: Terrestrial Realm. South African National Biodiversity Institute, Pretoria, South Africa.

Statistics South Africa, 2011. Statistics South Africa, Pretoria, South Africa.

TBC, 2020a. Water Resource Assessment for the Proposed Matjhabeng Solar Photovoltaic (PV) with Battery Energy Storage Systems (BESS) Project, Report 1. The Biodiversity Company (TBC), Johannesburg, South Africa.

TBC, 2020b. Terrestrial Assessment Report for the Proposed Matjhabeng Solar Photovoltaic (PV) with Battery Energy Storage Systems (BESS) Project, Report 1. The Biodiversity Company (TBC), Johannesburg, South Africa.

TBC, 2020c. Avifaunal Assessment Report for the Proposed Matjhabeng Solar Photovoltaic (PV) with Battery Energy Storage Systems (BESS) Project, Report 1. The Biodiversity Company (TBC), Johannesburg, South Africa.

van Schalkwyk, A., 2020. Phase 1 Cultural Heritage Impact Assessment: The Proposed Development of the Matjhabeng 400 MW Solar Photovoltaic (PV) Plant Located North and South of the Town of Odendaalsrus, Matjhabeng Municipality, Free State Province.

Visser, D.J.L. (ed), 1984. Geological Map of South Africa 1:100 000. South African Committee for Stratigraphy, Council for Geoscience, Pretoria, South Africa.

Websites:

https://egis.environment.gov.za/ renewable_energy

APPENDICES