BASIC ASSESSMENT REPORT

Draft – 30 August 2022

THE PROPOSED CASTOR SOLAR PV PROJECT NEAR BOSHOF, FREE STATE PROVINCE

ENVIRONAMICS

PROJECT DETAIL

DFFE Reference No.	**:**	To be confirmed
Project Title	**:**	The proposed Castor Solar PV Project near Boshof, Free State Province.
Authors	**:**	Ms. Lisa de Lange (Opperman) Ms. Christia van Dyk
Reviewer	:	Mrs. Carli van Niekerk
Client	**:**	Castor Solar PV Project (Pty) Ltd
Report Status	**:**	Draft Basic Assessment Report
Report date	**:**	30 August 2022

When used as a reference this report should be cited as: Environamics (2022) Draft BAR: The proposed Castor Solar PV Project near Boshof, Free State Province.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

PLATES

APPENDICES

GLOSSARY OF TERMS AND ACRONYMS

BA	Basic Assessment
BAR	Basic Assessment Report
BESS	Battery Energy Storage System
CEA	Cumulative Effects Assessment
DFFE	Department of Forestry, Fisheries and the Environment
DM	District Municipality
DMRE	Department of Mineral Resources and Energy
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
EP	Equator Principles
EPFI	Equator Principles Financial Institutions
Environmental impact	Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organization's environmental aspects.
GNR	Government Notice Regulation
I&AP	Interested and affected party
IDP	Integrated Development Plan
IFC	International Finance Corporation
IPP	Independent Power Producer
kV	Kilo Volt
Mitigate	Activities designed to compensate for unavoidable environmental damage.
MW	Megawatt
NEMA	National Environmental Management Act No. 107 of 1998
NERSA	National Energy Regulator of South Africa
NWA	National Water Act No. 36 of 1998
PPP	Public Participation Process
PV	Photovoltaic
REDZ	Renewable Energy Development Zone

REIPPP	Renewable Energy IPP Procurement Process
SAHRA	South African Heritage Resources Agency
SDF	Spatial Development Framework
SPP	Solar Power Plant
VU	Vegetation Unit

CONTEXT FOR THE DEVELOPMENT

According to Eskom, the demand for electricity in South Africa has been growing at approximately 3% per annum. This growing demand, fuelled by increasing economic growth and social development, is placing increasing pressure on South Africa's existing power generation capacity. Coupled with this, is the growing awareness of environmentally responsible development, the impacts of climate change and the need for sustainable development. The use of renewable energy technologies, as one of a mix of technologies needed to meet future energy consumption requirements, is being investigated as part of the national Department of Mineral Resources and Energy's (DMRE) (previously referred to as the Department of Energy) long-term strategic planning and research process.

The primary rationale for the proposed solar photovoltaic (PV) facility is to add new generation capacity from renewable energy to the national electricity mix and to aid in achieving the goal of 42% share of all new installed generating capacity being derived from renewable energy forms, as targeted by DMRE (2019 Integrated Resource Plan Update 2010-2030). The IRP also identifies the preferred generation technologies required to meet the expected demand growth up to 2030 and incorporates government objectives including affordable electricity, reduced greenhouse gas (GHG) emissions, reduced water consumption, diversified electricity generation sources and localisation and regional development. In terms of the Integrated Resource Plan Update (2019 IRP Update, 2010-2030), over the short term (of the next two or three years), clear guidelines arose; namely to continue with the current renewable bid programme with additional annual rounds of 1000MW PV, with approximately 8.4GW of the renewable energy capacity planned to be installed from PV technologies over the next twenty years.

The proposed project is intended to form part of the DMREs Renewable Energy Independent Power Producer Procurement (REIPPP) Programme or any other programs/opportunities to generate power in South Africa. The REIPPP Programme aims to secure 14 725 Megawatts (MW) of new generation capacity from renewable energy sources, while simultaneously diversifying South Africa's electricity mix. According to the 2021 State of the Nation Address, Government will initiate the procurement of an additional 11 800 MW of power from renewable energy, natural gas, battery storage and coal in line with the Integrated Resource Plan 2019 and fulfilling their commitments under the United Nations Framework Convention on Climate Change and its Paris Agreement which include the reduction of greenhouse gas emissions. Eskom, the largest greenhouse gas emitter of South Africa, has committed in principle to net zero emissions by 2050 and to increase its renewable capacity.

In response to the above, Castor Solar PV Project (Pty) Ltd is proposing the development of a photovoltaic solar facility and associated infrastructure for the purpose of commercial electricity generation on an identified site located on one affected property known as Portion 1 of the Farm Merriesfontein No. 1725, Registration Division Boshof, Free State Province (refer to Figure A for the locality map.

From a regional site selection perspective, this region is preferred for solar energy development due to its global horizontal irradiation value of around 2148 kwh/m^2. The region is also preferred based on its inclusion within the Kimberley Renewable Energy Development Zone (REDZ) 5.

EXECUTIVE SUMMARY

Like many other small and developing municipalities in the country, the Tokologo Local Municipality, within which the Castor Solar PV Project is proposed, faces a number of challenges in addressing the needs and improving the lives of the community. The Integrated Development Plan (IDP) (2020-2021) of the Local Municipality identifies critical issues experienced within the area, which includes electricity reticulation. The IDP has set an objective to ensure that 90% of the households in the municipal area have electricity by end 2020/21, with the outcome of the objective being that 90% of households in formal areas with access to electricity. However, as there is no updated IDP available for the year 2022 it is not clear whether this critical issue has been dealt with and the goals reached in this regard.

Castor Solar PV Project (Pty) Ltd intends to develop a photovoltaic solar facility and associated infrastructure on one affected property known as Portion 1 of the Farm Merriesfontein No. 1725, Registration Division Boshof, Free State Province. The project entails the generation of up to 20MW electrical power through photovoltaic (PV) technology. The total development footprint of the project will be ~40 hectares (including supporting and grid connection infrastructure on site) within the 72 hectares identified and assessed within the affected property as part of the Basic Assessment process. (refer to Figure A and Figure B for the respective locality and regional maps). The site[1] was identified as being highly desirable due to its suitable climatic conditions, topography (i.e. in terms of slope), environmental conditions (i.e. agricultural potential, ecological sensitivity and archaeology), proximity to a grid connection point (i.e. for the purpose of electricity evacuation into the national grid), as well as site access via a main road (i.e. to facilitate the movement of machinery, equipment, infrastructure and people during the construction phase). Grid connection infrastructure is also being proposed and assessed within this report. The grid connection infrastructure includes a 22kV or 66kV power line to connect the facility from an on-site substation to the national grid via a direct connection to the existing Bosplaat Rural Substation located within the affected property. A grid connection corridor with a width of between 50m and 200m, have been identified for the assessment and placement of the power line. Within the grid connection corridor, five alternative power line routes are being proposed and assessed.

In terms of the National Environmental Management Act (Act 107 of 1998), with specific reference to Sections 24 and 24D, as read with GNR 324-327, as amended (2017), Environmental Authorisation is required for the Castor Solar PV Project. The following listed activities have been identified with special reference to the proposed development and is listed in the EIA Regulations (as amended):

- Activity 11(i) (GNR 327): *"The development of facilities or infrastructure for the transmission and distribution of electricity outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts."*
- Activity 24 (ii) (GN.R 327): *"The development of a road (ii) with reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 meters"*
- Activity 28 (ii) (GN.R 327): *"Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture or afforestation on or after 1998 and*

[1] The site is defined as the 72ha area identified within the affected property. The full extent of the site has been assessed as part of this BA process for the development by the EAP and the independent specialists.

where such development (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare."

- Activity 56 (ii) (GN.R 327): *"The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre (ii) where no reserve exists, where the existing road is wider than 8 metres…"*
- Activity 1 (GN.R 325): *"The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more."*
- Activity 15 (GN.R 325): *"The clearance of an area of 20 hectares or more of indigenous vegetation."*
- Activity 4 (b)(i)(gg) (GN.R 324): *"The development of a road wider than 4 metres with a reserve less than 13,5 metres (b) in the Free State, (i) outside urban areas and (gg) areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve, excluding disturbed areas."*
- Activity 12 (b)(iv) (GN.R 324): *"The clearance of an area of 300 square metres or more of indigenous vegetation…(b) in the Free State within (iv) areas within a watercourse or wetland; or within 100 metres from the edge of watercourse or wetland."*
- Activity 18 (b)(i)(gg)(hh) (GN.R 324): *"The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre (b) in the Free State (i) outside urban areas, within (gg) areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve, excluding disturbed areas and (hh) Areas within a watercourse or wetland; or within 100 metres from the edge of a watercourse or wetland."*

Activities required for the development of the solar facility which are listed under Listing Notice 1, 2 and 3 (GNR 327, 325 & 324) implies that the development could potentially have an impact on the environment that will require mitigation. The proposed Castor Solar PV Project is located within the Kimberley Renewable Energy Development Zone (REDZ) and subsequently a Basic Assessment process is required to be followed as described in Regulations 19 and 20 of the EIA Regulations (as amended). Environamics has been appointed as the independent Environmental Assessment Practitioner to undertake the Basic Assessment (BA) on behalf of Castor Solar PV Project (Pty) Ltd.

Regulation 19 of the EIA Regulations (2017) requires that a Basic Assessment Report (BAR) must contain the information set out in Appendix 1 of the Regulations or comply with a protocol or minimum information requirements relevant to the application as identified and gazetted by the Minister in a government notice. Appendix 1 of GNR326 requires that the environmental outcomes, impacts and residual risks of the proposed activity be set out in the BAR. It has been determined through the BA process that the proposed development will have a net positive impact for the area and will subsequently ensure the optimal utilisation of resources and land. All negative environmental impacts can be effectively mitigated through the recommended mitigation measures and no residual negative impacts are foreseen. The potentially most significant environmental impacts associated with the development are briefly summarized below.

Impacts during the construction phase:

Construction of the Castor solar PV Project will potentially result in the following impacts: impacts on habitats, invasion of alien plants, impacts to fauna and flora, traffic impacts, visual impact on observers in-migration or influx of job seekers, presence of construction workers on the local communities, increased risk of veld fires, impacts on daily living and movement patterns and generation of waste. Socio-economic impacts such as the creation of local employment and business opportunities, skills development and training and technical support to local farmers and municipalities will be positive impacts emanating from the construction.

Impacts during the operational phase:

During the operational phase, the site will serve as a solar energy facility and the potential impacts will take place over a period of 20 – 25 years. The negative impacts are generally associated with impacts on the fauna and flora, spread and establishment of alien invasive species, displacement of priority and resident avifauna, collisions of avifauna with PV array and power lines, avifauna electrocution when perched on infrastructure, visual impacts and limited traffic impacts. The provision of sustainable service delivery from the local municipality also needs to be confirmed. The operational phase will have a direct positive impact through the provision of employment opportunities for its duration, and the generation of income to the local community. Additional electricity will also be generated from a clean renewable resource.

Impacts during the decommissioning phase:

The physical environment will benefit from the closure of the Castor Solar PV Project since the site will be rehabilitated to an acceptable state. The decommissioning phase will however potentially result in impact on the fauna and flora, dust impacts, and the loss of permanent employment. Skilled staff will be eminently employable, and a number of temporary jobs will also be created in the process.

Cumulative impacts:

The cumulative impact for the proposed development is medium to low and no high, unacceptable impacts related to the project is expected. Considering the extent of the project and information presented in section 7 of this report, it can be concluded that the cumulative impacts will not result in large scale changes and impacts on the environment. This is also based on the fact that only two other solar energy facilities are located within the geographic area of investigation and the vegetation associated with the area considered as Least Threatened, as well as the limited development footprint (~40ha) associated with the Castor Solar PV Project.

In accordance with the EIA Regulations, this draft BAR evaluates and rates each identified potential impact and identifies and recommends mitigation measures which will be required in order to ensure the reduction of the impact significance of negative impacts to acceptable levels and the avoidance of negative residual risks. This draft BAR also contains information that is required by the competent authority (Department of Forestry, Fisheries and the Environment (DFFE)) to consider the Application for Environmental Authorisation and to reach a decision contemplated in Regulation 20 of GNR 326. No fatal flaws or impacts with unacceptable levels of significance were identified and the impacts from the proposed development are expected to be at an acceptable level with the implementation of mitigation measures and therefore the project can be authorised subject to the implementation of the recommended mitigation measures.

1 INTRODUCTION

This section aims to introduce the Basic Assessment Report (BAR) and specifically to address the following requirements of the regulations:

Appendix 1. (3) A basic assessment report must contain the information that is necessary for the competent authority to consider and come to a decision on the application, and must include- (a) details of: (i) the EAP who prepared the report; and (ii) the expertise of the EAP, including a curriculum vitae.

1.1 LEGAL MANDATE AND PURPOSE OF THE REPORT

The National Environmental Management Act identifies listed activities (in terms of Section 24) which are likely to have an impact on the environment. These activities cannot commence without obtaining an EA from the relevant competent authority. Sufficient information is required by the competent authority to make an informed decision and the project is therefore subject to an environmental assessment process which can be either a Basic Assessment Process or a full Scoping and Environmental Impact Assessment process.

The EIA Regulations No. 324, 325, and 327 outline the activities that may be triggered and therefore require EA. The following listed activities with special reference to the proposed development is triggered:

Table 1.1: Listed activities

Relevant notice:	**Activity No (s)**	**Description of each listed activity as per project description**:
GNR. 327 (as amended in 2017)	Activity 11(i)	● *"The development of facilities or infrastructure for the transmission and distribution of electricity (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts."* ● Activity 11(i) is triggered as the solar project will transmit and distribute electricity of up to 66 kilovolts outside an urban area. The infrastructure for the distribution of electricity will include a power line (66 kV), an on-site substation and switching stations. It is expected that generation from the facility will tie in with the existing Bosplaat Rural Substation.
GNR. 327 (as amended in 2017)	Activity 24(ii)	● *"The development of a road (ii) with reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 meters;"*

		● Activity 24(ii) is triggered as the access road to the site will be ~8m wide.
GNR. 327 (as amended in 2017)	Activity 28(ii)	● *"Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture or afforestation on or after 1998 and where such development (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare."* ● Activity 28(ii) is triggered as portions of the affected property has been used for grazing and the property will be re-zoned to "special" use for the proposed development. The development footprint of the solar project will be 40 hectares.
GNR. 327 (as amended in 2017)	Activity 56 (ii):	● *"The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre (ii) where no reserve exists, where the existing road is wider than 8 metres…"* ● Activity 56 (ii) is triggered as the existing access to the affected property does not have a reserve and will need to be widened by more than 6 metres.
GNR. 325 (as amended in 2017)	Activity 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."* ● Activity 1 is triggered since the proposed solar project will generate up to 20 megawatts electricity through the use of a renewable resource.
GNR. 325 (as amended in 2017)	Activity 15	● *"The clearance of an area of 20 hectares or more of indigenous vegetation."* ● Activity 15 is triggered since portions of the site have not been lawfully disturbed during the preceding ten years; therefore, more than 20 hectares of indigenous vegetation will be removed. The development footprint of the solar project will be 40 hectares.
GNR. 324 (as amended in 2017)	Activity 4 (b)(i)(gg)	● *"The development of a road wider than 4 metres with a reserve less than 13,5 metres (b) in the Free State, (i) outside urban areas and (gg) areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or*

		from the core areas of a biosphere reserve, excluding disturbed areas." ● Activity 4(b)(i)(gg) is triggered since the internal roads will not have a reserve and will 6 meters in width, and the main access to the site 8 meters in width. The project is located within 5km of a protected area in terms of NEMPAA, known as Boshof Nature Reserve located approximately 1km west of the proposed solar project as per the South Africa Protected Area Database of the Department of Forestry, Fisheries and the Environment.
GNR. 324 (as amended in 2017)	Activity 12 (b)(iv)	● *"The clearance of an area of 300 square metres or more of indigenous vegetation…(b) in the Free State within (iv) areas within a watercourse or wetland; or within 100 metres from the edge of watercourse or wetland."* ● Activity 12(b)(iv) is triggered since the proposed development is located in the Free State province. Portions of the site have not been lawfully disturbed during the preceding ten years, and the development footprint will be 40 hectares in extent. Furthermore, two depression wetlands are located outside of the site, on the opposite side of the R64, which fall within 100m of the proposed solar project. An artificial wetland (cement dam) is located within the area under assessment but outside of the development footprint.
GNR. 324 (as amended in 2017)	Activity 18 (b)(i)(gg)(hh)	● *"The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre (b) in the Free State (i) outside urban areas, within (gg) areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve, excluding disturbed areas and (hh) Areas within a watercourse or wetland; or within 100 metres from the edge of a watercourse or wetland."* ● Activity 18 (b)(i)(gg)(hh) is triggered since the existing access to the affected property does not have a reserve and will need to be widened by more than 6 metres. The proposed development is located in the Free State province, outside of an urban area. The project is located within 5km of a protected area in terms of NEMPAA, known as Boshof Nature Reserve located approximately 1km west

		of the proposed solar project as per the South Africa Protected Area Database of the Department of Forestry, Fisheries and the Environment. Furthermore, two depression wetlands are located outside of the site, on the opposite side of the R64, which fall within 100m of the proposed solar project.

The activities triggered under Listing Notice 1, 2 and 3 (Regulation 327, 325 & 324) for the project implies that the development is considered as potentially having an impact on the environment and therefore require the implementation of appropriate mitigation measures. Based on the location of the entire extent of the project within the Kimberley REDZ (see Figure D), the process to be followed will be as per GNR 114, as gazetted on 16 February 2018. Therefore, the Castor Solar PV Project is subject to a Basic Assessment process and not a full EIA process, as well as a shortened timeframe for the processing of the Application for Environmental Authorisation by the Department of Forestry, Fisheries and the Environment (DFFE). The Basic Assessment must be undertaken in line with the requirements stipulated under Regulations 19 – 20 of the EIA Regulations. According to Appendix 1 of Regulation 326, the objective of the basic assessment process is to, 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;
- Identify the alternatives considered, including the activity, location, and technology alternatives;
- Describe the need and desirability of the proposed alternatives;
- Through the undertaking of an impact and risk assessment process, inclusive of cumulative impacts which focused on determining the geographical, physical, biological, social, economic, heritage and cultural sensitivity of the sites and locations within sites and the risk of impact of the proposed activity and technology alternatives on these aspects to determine —
    - The nature, significance, consequence, extent, duration and probability of the impacts occurring; and
    - degree to which these impacts-
        - can be reversed;
        - may cause irreplaceable loss of resources, and
        - can be avoided, managed or mitigated; and
- Through a ranking of the site sensitivities and possible impacts the activity and technology alternatives will impose on the sites and location identified through the life of the activity to –
    - Identify and motivate a preferred site, activity and technology alternative;
    - Identify suitable measures to avoid, manage or mitigate identified impacts; and
    - Identify residual risks that need to be managed and monitored.

This report is the draft Basic Assessment Report (BAR) that has been submitted to the Department of Forestry, Fisheries and the Environment (DFFE) for review and comment. According to GNR 326 all registered interested and affected parties (I&APs) and relevant State Departments (including Organs of State) must be allowed the opportunity to review and provide comment on the report. The draft BAR has been made available to registered I&APs and all relevant State Departments for a 30-day review and comment period from 30 August 2022 to 30 September 2022. They have been requested to provide written comments on the BAR within 30 days of receiving it. All issues identified during the review period will be documented and compiled into a Comments and Response Report (Appendix C6) to be submitted as part of the Final BAR to DFFE for decision-making.

1.2 DETAILS OF THE ENVIRONMENTAL ASSESSMENT PRACTITIONER (EAP)

Environamics was appointed by the applicant as the independent EAP to conduct the BA and prepare all required reports. All correspondence to the EAP can be directed to:

Contact person:	Lisa de Lange (Opperman)
EAPASA Registration:	2020/2150
Postal Address:	14 Kingfisher Street, Tuscany Ridge Estate, Potchefstroom, 2531
Telephone:	084 920 3111 (Cell)
Electronic Mail:	lisa@environamics.co.za

Regulation 13(1)(a) and (b) determines that an independent and suitably qualified and experienced EAP should conduct the BA. In terms of the independent status of the EAP, a declaration is attached as Appendix A to this report. The expertise of the EAP responsible for conducting the BA is also summarized in the curriculum vitae included as part of Appendix A.

1.3 DETAILS OF SPECIALISTS

Table 1.2 provides information of the independent specialists that have been appointed as part of the Basic Assessment process. Regulation 13(1)(a) and (b) determines that an independent and suitably qualified and experienced specialist should conduct the specialist study. In the event where the specialist is not independent, a specialist should be appointed to externally review the work of the specialist as contemplated in sub regulation (2), which must comply with sub regulation 1. In terms of the independent status of the specialists, their declarations are attached as Appendix D to this report. The expertise of the specialists is also summarized in their respective curriculum vitae's.

Table 1.2: Details of specialists

Study	Prepared by	Contact Person	Postal Address	Tel	e-mail
Avifaunal Impact Assessment	The Biodiversity Company	Mahomed Desai	-	Cell: 081 319 1225	info@thebiodiversitycompany.com
Terrestrial Ecology Impact Assessment	The Biodiversity Company	Michael Schrenk	-	Cell: 081 319 1225	info@thebiodiversitycompany.com
Wetland Impact and Risk Assessment	The Biodiversity Company	Rian Pienaar	-	Cell: 081 319 1225	info@thebiodiversitycompany.com
Heritage Impact Assessment	J van Schalkwyk Heritage Consultant	J van Schalkwyk	62 Coetzer Avenue Monument Park 0181	Cell: 076 790 6777	jvschalkwyk@mweb.co.za
Agricultural Compliance Statement	The Biodiversity Company	Maletsatsi Mohapi	-	Cell: 081 319 1225	info@thebiodiversitycompany.com
Visual Impact Assessment	Donaway Environmental Consultants	Johan Botha	30 Fouche Street Steynsrus, 9515	Tel: 082 316 7749	johan@donaway.co.za
Social Impact Assessment	Donaway Environmental Consultants	Marelie Botha	30 Fouche Street Steynsrus, 9515	Cell: 082 493 5166	marelie@donaway.co.za
Traffic Assessment Study	BVi Consulting Engineers	Jacques Nel	Edison Square, Century City, 7441	Cell: 082 922 1446	jacquesn@bviwc.co.za

1.4 STATUS OF THE BA PROCESS

The BA process is conducted strictly in accordance with the stipulations set out in Regulations 19 – 20 and Annexure 1 of Regulation No. 326. Table 1.3 provides a summary of the BA process and future steps to be taken. It can be confirmed that to date:

- A site visit was conducted on 27 May 2022 and site notices were erected.
- A pre-application meeting request and public participation plan was submitted to DFFE on 14 July 2022. It has since been advise by the DFFE that the approval of a Public Participation Plan, prior to the submission of an Application for Environmental Authorisation, is no longer required.
- A newspaper advertisement was placed in the Noordkaap Bulletin on 30 June 2022 for the initial public participation.
- An application for Environmental Authorisation and the draft BAR was submitted to the DFFE on 30 August 2022.
- The Basic Assessment report has been made available for a 30-day review and comment period from 30 August 2022 to 30 September 2022.

It is envisaged that the BA process should be completed within approximately five months of submitting the Application for EA and the BAR, i.e. by December 2022 – see Table 1.3.

Table 1.3: Project schedule

Activity	Prescribed timeframe	Timeframe
Site visits (Initial PP – Press Advertisement & Site Notices).	-	27 May & 30 June 2022
Public Participation (Background Information Document)	30 Days	14 July – 15 August 2022
Submit application form and DBAR	-	30 August 2022
Public participation (DBAR)	30 Days	30 August – 30 September 2022
Submit FBAR	90 Days	October 2022
Department acknowledges receipt	10 Days	October 2022
Decision	57 Days	By November 2022
Department notifies of decision	5 Days	By November 2022
Registered I&APs notified of decision	14 Days	November 2022
Appeal	20 Days	By December 2022

1.5 SPECIALIST STUDIES IDENTIFIED IN THE DFFE SCREENING TOOL REPORT

The table included below provides an indication of the specialist studies identified by the DFFE Screening Tool Report (Appendix B), an indication of whether the studies were undertaken or not and a motivation or confirmation of the studies being included or not.

Study identified in the DFFE Screening Tool and sensitivity	Study included?	Confirmation / motivation
Agricultural Impact Assessment Sensitivity: Medium	Yes	An Agricultural Compliance Statement is included in Appendix D4. The site sensitivity is confirmed in the report as low and low moderate
Landscape / Visual Impact Assessment Sensitivity: Very High	Yes	A Visual Impact Assessment is included in Appendix D3.
Archaeological and Cultural Heritage Impact Assessment Sensitivity: Low	Yes	A Heritage Impact Assessment is included in Appendix D5.
Palaeontological Impact Assessment Sensitivity: Medium	Yes	A desktop Palaeontological Impact Assessment is included in Appendix D6. The sensitivity of the site is confirmed as low in the report.
Terrestrial Biodiversity Impact Assessment Sensitivity: Very High	Yes	A Terrestrial Ecology Impact Assessment is included in Appendix D1. This assessment has been undertaken in terms of the Protocols of GNR320 – refer to the content of the report.
Aquatic Biodiversity Impact Assessment Sensitivity: Low	No	A Wetland Impact and Risk Assessment is included in Appendix D9. This assessment has been undertaken in terms of the Protocols of GNR320 – refer to the content of the report.
Civil Aviation Assessment Sensitivity: Low	No	The Civil Aviation Authority has been consulted regarding the development of the project since

		the commencement of the BA Process. No specific negative impacts or issues have been raised to date by the CAA regarding the project. The project is also not located within an area considered to be of a high sensitivity.
Defence Assessment Sensitivity: Low	No	The sensitivity for the entire extent of the site is low and therefore no assessment has been included.
RFI Assessment Sensitivity: Low	No	The RFI theme sensitivity is low for the entire extent of the project. The South African Radio Astronomy Observatory (SARAO) has been consulted regarding the development of the project since the commencement of the EIA Process. No specific negative impacts or issues have been raised to date by the SARAO regarding the project. The project is also not located within an area considered to be of a high sensitivity.
Geotechnical Assessment Sensitivity: Not indicated	No	The Geotechnical Assessment will be undertaken by the Applicant as part of the micro-siting process for the development.
Socio-Economic Assessment Sensitivity: Not indicated	Yes	A Social Impact Assessment is included in Appendix D7.
Plant species Assessment Sensitivity: Medium	Yes	Refer to Appendix D1. The Terrestrial Ecology Impact Assessment also includes the relevant Plant Species Assessment. This assessment has been undertaken in terms of the Protocols of GNR320 – refer to the content of the report.
Animal Species Assessment Sensitivity: Animal	Yes	Refer to Appendix D1. The Terrestrial Ecology Impact Assessment also includes the

		relevant Animal Species Assessment. This assessment has been undertaken in terms of the Protocols of GNR320 – refer to the content of the report.

1.6 STRUCTURE OF THE REPORT

This report is structured in accordance with the prescribed contents stipulated in Appendix 1 of Regulation No. 326. It consists of seven sections demonstrating compliance to the specifications of the regulations as illustrated in Table 1.4.

Table 1.4: Structure of the report

Requirements for the contents of a BAR as specified in the Regulations		Section in report
Appendix 1. (3) - A basic assessment report must contain the information that is necessary for the competent authority to consider and come to a decision on the application, and must include-		
(a)	details of -	1
	(i) the EAP who prepared the report; and	
	ii) the expertise of the EAP, including a curriculum vitae.	
(b)	the location of the activity, including-	2
	(i) the 21-digit Surveyor General code of each cadastral land parcel;	
	(ii) where available, the physical address and farm name;	
	(iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties;	
(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; or	
	(ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken;	
(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 activities to be undertaken including associated structures and infrastructure.	
(e)	a description of the policy and legislative context within which the development is proposed including:	3
	(i) An identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks, and instruments that are applicable to this activity and have been considered in the preparation of the report; and	
	(ii) How the proposed activity complies with and responds to the legislation and policy context, plans, guidelines, tools frameworks and instruments;	
(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 location;	4
(g)	A motivation for the preferred site, activity and technology alternative.	5
(h)	a full description of the process followed to reach the preferred alternative within the site including –	
	(i) details of all the alternatives considered;	
	(ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs;	
	(iii) a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them.	
	(iv) the environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	
	(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- (aa) can be reversed; (bb) may cause irreplaceable loss of resources; and (cc) can be avoided, managed or mitigated;	6 & 7
	(vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks associated with the alternatives;	
	(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;	
	(viii) the possible mitigation measures that could be applied and level of residual risk;	
	(ix) the outcomes of the site selection matrix;	
	(x) if no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such; and	
	(xi) a concluding statement indicating the preferred alternatives, including preferred location of the activity;	
(i)	a full description of the process undertaken to identify, assess and rank the impacts the activity will impose on the preferred location through the life of the activity, including -	
	(i) a description of all environmental issues and risks that were identified during the EIA 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.	
(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;	
(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;	6
(l)	an environmental impact statement which contains-	8
	(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 site 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;	
(m)	based on the assessment, and where applicable, impact management measures from specialist reports, the recording of proposed impact management objectives, and the impact management outcomes for the development for inclusion in the EMPr;	
(n)	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;	Not applicable
(o)	a description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed;	8
(p)	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;	
(q)	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;	Not applicable
(r)	an undertaking under oath or affirmation by the EAP in relation to-	Appendix A to the report
	(i) the correctness of the information provided in the report;	
	(ii) the inclusion of comments and inputs from stakeholders and interested and affected parties (I&APs);	
	(iii) the inclusion of inputs and recommendations from the specialist reports where relevant; and	
	(iv) any information provided by the EAP to I&APs and any responses by the EAP to comments or inputs made by I&APs; and	
(s)	where applicable, details of any financial provisions for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts;	Not applicable
(t)	any specific information that may be required by the CA; and	Not applicable
(u)	any other matters required in terms of section 24(4)(a) and (b) of the Act.	Not applicable

2 ACTIVITY DESCRIPTION

.

This section aims to address the following requirements of the regulations:

Appendix 1. (3) An BAR (...) must include-

(b) the location of the activity, including-

(i) the 21-digit Surveyor General code of each cadastral land parcel;

(ii) where available, the physical address and farm name;

(iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties;

(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; or

(ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken;

(d) a description of the scope of the proposed activity, including-

(i) all listed and specified activities triggered and being applied for;

(ii) a description of the associated structures and infrastructure related to the development.

2.1 THE LOCATION OF THE ACTIVITY AND PROPERTY DESCRIPTION

The activity entails the development of a photovoltaic solar facility and associated infrastructure on Portion 1 of the Farm Merriesfontein No. 1725, Registration Division Boshof, Free State Province situated within the Tokologo Local Municipality. The proposed development is located in the Free State Province in the central interior of South-Africa (refer to Figure B for the regional map). The town of Boshof is located approximately 2km north west of the proposed development (refer to Figure A for the locality map).

The project entails the generation of up to 20MW electrical power through the operation of photovoltaic (PV) panels. The total development footprint of the project will approximately be 40 hectares (including supporting and grid infrastructure on site) within the 72 hectares identified and assessed as part of the Basic Assessment process, which is located within the affected property – refer to Table 2.1 for general site information. The property on which the facility is to be constructed will be leased by Castor Solar PV Project (Pty) Ltd from the property owner for the lifespan of the project (minimum of 20 years).

It must be noted that an Environmental Authorisation was previously obtained on the affected property for the proposed Boshof – Les Marais / Buitefontein Solar Energy Facility under the DEA (Department of Environmental Affairs) Reference number 14/12/16/3/3/1/1090). This EIA process was concluded in March 2014 and the project received EA on 10 July 2014. This project was quite

small and only catered for the generation of up to 5MW of electricity. The EA of this development lapsed on 10 July 2021, and is therefore no longer available for development. With the rapid growth of the need for renewable energy in the country and considering the changes in the renewable energy sector since 2014 the Applicant is now proposing the development of the Castor Solar PV Project which will produce more than double the capacity as the previously authorised Boshof – Les Marais / Buitefontein Solar Energy Facility.

Table 2.1: General site information

Description of affected farm portion	Solar Energy Facility Portion 1 of the Farm Merriesfontein No. 1725 Power Line Corridor Portion 1 of the Farm Merriesfontein No. 1725
Province	Free State
District Municipality	Lejweleputswa District Municipality
Local Municipality	Tokologo Local Municipality
Ward numbers	1
Closest towns	The town of Boshof is located approximately 2km north west of the proposed development
21 Digit Surveyor General codes	Portion 1 of the Farm Merriesfontein No. 1725: F00400000000172500001
Type of technology	Photovoltaic solar facility
Structure Height	Panels 4m – 6m, buildings ~ 6m, power line ~32m
Surface area to be covered (Development footprint)	Approximately 40 hectares
Laydown area dimensions (EIA footprint)	Assessed 72 hectares (area identified within the affected property for assessment for the placement of the development footprint)
Structure orientation	Tracking PV with bi-facial panels. Bi-facial panels with single axis tracking a preferred over fixed-axis or double axis tracking systems, and mono-facial panels due to the potential to achieve higher annual energy yields whilst minimising the balance of system (BOS) costs, resulting in the lowest level cost of energy (LCOE). The development of the PV facility will take into consideration during the final design phase the use of either mono-facial or bi-facial PV panels as well as tracker vs fixed-tilt mounting structures.

Generation capacity	Up to 20MW (based on the available technology at the time of construction)

The project infrastructure will be located fully within the 40 hectares development footprint. This will include all associated and grid connection infrastructure.

The site is located in a rural area and is bordered by farms where mainly agricultural activities are undertaken. The site survey revealed that the affected property currently consists of grazing cattle as well as game farming – refer to plates 1-13 for photographs of the development area. Furthermore, the affected property is zoned for mixed use.

2.2 ACTIVITY DESCRIPTION

The proposed development will trigger the following activity:

Table 2.2: Listed activities

Relevant notice:	**Activity No (s)**	**Description of each listed activity as per project description**:
GNR. 327 (as amended in 2017)	Activity 11(i)	● *"The development of facilities or infrastructure for the transmission and distribution of electricity (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts."* ● Activity 11(i) is triggered as the solar project will transmit and distribute electricity of up to 66 kilovolts outside an urban area. The infrastructure for the distribution of electricity will include a power line (66 kV), an on-site substation and switching stations. It is expected that generation from the facility will tie in with the existing Bosplaat Rural Substation.
GNR. 327 (as amended in 2017)	Activity 24(ii)	● *"The development of a road (ii) with reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 meters;"* ● Activity 24(ii) is triggered as the access road to the site will be ~8m wide.
GNR. 327 (as amended in 2017)	Activity 28(ii)	● *"Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture or afforestation on or after 1998 and where such development (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare."* ● Activity 28(ii) is triggered as portions of the affected property has been used for grazing and the property will

		be re-zoned to "special" use for the proposed development. The development footprint of the solar project will be 40 hectares.
GNR. 327 (as amended in 2017)	Activity 56 (ii):	● *"The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre (ii) where no reserve exists, where the existing road is wider than 8 metres…"* ● Activity 56 (ii) is triggered as the existing access to the affected property does not have a reserve and will need to be widened by more than 6 metres.
GNR. 325 (as amended in 2017)	Activity 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."* ● Activity 1 is triggered since the proposed solar project will generate up to 20 megawatts electricity through the use of a renewable resource.
GNR. 325 (as amended in 2017)	Activity 15	● *"The clearance of an area of 20 hectares or more of indigenous vegetation."* ● Activity 15 is triggered since portions of the site have not been lawfully disturbed during the preceding ten years; therefore, more than 20 hectares of indigenous vegetation will be removed. The development footprint of the solar project will be 40 hectares.
GNR. 324 (as amended in 2017)	Activity 4 (b)(i)(gg)	● *"The development of a road wider than 4 metres with a reserve less than 13,5 metres (b) in the Free State, (i) outside urban areas and (gg) areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve, excluding disturbed areas."* ● Activity 4(b)(i)(gg) is triggered since the internal roads will not have a reserve and will 6 meters in width, and the main access to the site 8 meters in width. The project is located within 5km of a protected area in terms of NEMPAA, known as Boshof Nature Reserve located approximately 1km west of the proposed solar project as per the South Africa Protected Area Database of the Department of Forestry, Fisheries and the Environment.

GNR. 324 (as amended in 2017)	Activity 12 (b)(iv)	• *"The clearance of an area of 300 square metres or more of indigenous vegetation…(b) in the Free State within (iv) areas within a watercourse or wetland; or within 100 metres from the edge of watercourse or wetland."* • Activity 12(b)(iv) is triggered since the proposed development is located in the Free State province. Portions of the site have not been lawfully disturbed during the preceding ten years, and the development footprint will be 40 hectares in extent. Furthermore, two depression wetlands are located outside of the site, on the opposite side of the R64, which fall within 100m of the proposed solar project. An artificial wetland (cement dam) is located within the area under assessment but outside of the development footprint.
GNR. 324 (as amended in 2017)	Activity 18 (b)(i)(gg)(hh)	• *"The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre (b) in the Free State (i) outside urban areas, within (gg) areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve, excluding disturbed areas and (hh) Areas within a watercourse or wetland; or within 100 metres from the edge of a watercourse or wetland."* • Activity 18 (b)(i)(gg)(hh) is triggered since the existing access to the affected property does not have a reserve and will need to be widened by more than 6 metres. The proposed development is located in the Free State province, outside of an urban area. The project is located within 5km of a protected area in terms of NEMPAA, known as Boshof Nature Reserve located approximately 1km west of the proposed solar project as per the South Africa Protected Area Database of the Department of Forestry, Fisheries and the Environment. Furthermore, two depression wetlands are located outside of the site, on the opposite side of the R64, which fall within 100m of the proposed solar project.

The potentially most significant impacts will occur during the construction phase of the development, which will include the following activities:

- Site clearing and preparation: Certain areas of the site will need to be cleared of vegetation and access to the site will need to be confirmed.
- Civil works to be conducted:
    - Terrain levelling if necessary– Levelling will be minimal as the potential site chosen is relatively flat.
    - Laying foundation- The structures will be connected to the ground through cement pillars, cement slabs or metal screws. The exact method will depend on the detailed geotechnical analysis and recommendations from the relevant specialists.
    - Construction of access roads/paths – existing paths will be used were reasonably possible. A short access road will be used to link the site with the existing R64 regional road located to the south of the project. The turning circles for trucks will also be taken into consideration.
    - Trenching – all Direct Current (DC) and Alternating Current (AC) wiring within the facility will be buried underground. Trenches will have a river sand base, space for pipes, backfill of sifted soil and soft sand and concrete layering where vehicles will pass.

2.3 PHOTOVOLTAIC TECHNOLOGY

The term photovoltaic describes a solid-state electronic cell that produces direct current electrical energy from the radiant energy of the sun through a process known as the Photovoltaic Effect. This refers to light energy placing electrons into a higher state of energy to create electricity. Each PV cell is made of silicon (i.e. semiconductors), which is positively and negatively charged on either side, with electrical conductors attached to both sides to form a circuit. This circuit captures the released electrons in the form of an electric current (direct current). The key components of the proposed project are described below:

- PV Panel Array - To produce up to 20MW, the proposed facilities will require numerous linked cells placed behind a protective glass sheet to form a panel. Multiple panels will be required to form the solar PV arrays which will comprise the PV facility. The PV panels will be mounted to a single access tracking frame system as well as fixed-tilt mounting structures.
- Wiring to String or Central Inverters - Sections of the PV array will be wired to either string or central inverters. The inverter is a pulse width mode inverter that converts direct current (DC) electricity to alternating current (AC) electricity at grid frequency.
- Connection to the grid - - Connecting the PV plant to the electrical grid requires transformation of voltage to 22kV or 66kV. The normal components and dimensions of a distribution rated electrical substation will be required. An onsite substation and switching stations will be required on the site to step the voltage up to 22kV or 66kV, after which the power will be evacuated into the national grid via a new proposed power line. It is expected that generation from the facility will tie in with the existing Bosplaat Rural Substation located within the affected property. The power line routes (five options for the alignment)

will be assessed within a grid connection corridor of between 50 and 200m wide, which will connect the project to the existing Eskom substation compound. All five route options fall within the grid connection corridor proposed and assessed and all five are considered to be technically feasible. This will provide flexibility for the development from a technical perspective.

Figure 2.1 below provides an indication of the grid connection corridor, which includes the five power line route options assessed.

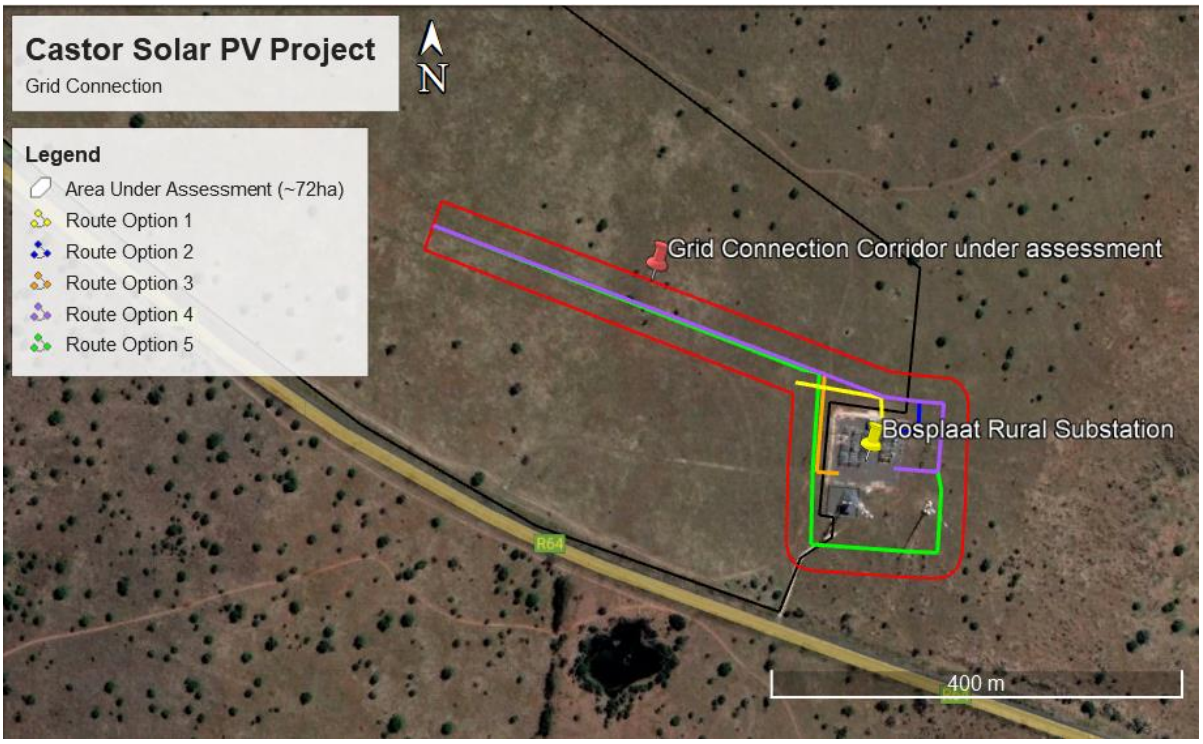


Figure 2.1: Grid connection corridor proposed for the Castor Solar PV Project

Following the assessment of the site and grid connection corridor by the specialists the ecologist identified an area to the south of the Bosplaat Rural Substation which is categorised as Rocky Thornveld Habitat, and of a high ecological sensitivity.

Based on the above, the Applicant has discarded Route Option 5 within the grid connection corridor to ensure that infringement into the sensitive habitat is completely avoided. Therefore, only 4 route options within the assessed grid connection corridor are being proposed for development. It is however requested that the entire grid connection corridor be authorised as to provide technical flexibility for the grid connection solution. Refer to Figure 2.2.

Figure 2.2: Final grid connection routes proposed for the Castor Solar PV Project within the assessed grid connection corridor

- Electrical reticulation network – An internal electrical reticulation network will be required and will be lain ~2-4 m underground as far as practically possible.
- Supporting Infrastructure – The following auxiliary buildings with basic services including water and electricity will be required on site:
    - Roads: 6600m^2
    - Access gate: 10m
    - O&M Building: 400m^2
    - Laydown Area: 2000m^2
- Roads – Access will be obtained via the R64 regional road to the south of the site. An internal site road network will also be required to provide access to the solar field and associated infrastructure.
- Fencing - For health, safety and security reasons, the facility will be required to be fenced off from the surrounding farm. Fencing with a height of up to 3 meters will be used.

2.4 LAYOUT DESCRIPTION

The layout plan will consider and adhere to the limitations of the site and aspects such as environmentally sensitive areas, areas deemed as important for use by the landowner, roads, fencing and servitudes on site. The total surface area covered by the layout include the PV panel arrays (spaced to avoid shadowing), access and maintenance roads and associated infrastructure (buildings, power

inverters, power lines, onsite substation and switching station and perimeter fences). Limited environmental features of significance exist on site. A layout plan is included in Appendix G under Layout Plans in the report, as well as Figures H and I, which illustrates how the Applicant has considered the findings of the independent environmental specialist studies (Appendix D). Table 2.3 below provides detailed information regarding the layout for the proposed facility as per DFFE requirements.

Table 2.3: Technical details for the proposed facility

Component	Description / dimensions
Height of PV panels	4 - 6 meters
Area of PV Array	40 Hectares (Development footprint)
Number of inverters required	String inverters: Up to 119 Central inverters: Up to 6
Area occupied by inverter / transformer stations / substations	String inverters (per item): 1400m^2 Central inverters (per item): 2100m^2
Capacity of on-site substation	22kV or 66kV
Capacity of the power line	22kV or 66kV
Area occupied by both permanent and construction laydown areas	Permanent Laydown Area: 40 Hectares Construction Laydown Area: ~2000 m^2
Area occupied by buildings	Roads: 6600m^2 Access gate: 10m^2 Operations & Maintenance Building: 400m^2
Length of internal roads	Access Road: 50m (Existing Road) Internal Roads: 1000m
Width of internal roads	Access Road: 8m (Existing Road) Internal Roads: 6m
Proximity to grid connection	Approximately 250metres
Grid connection corridor width	50 - 200m
Grid connection corridor length	Up to 250m
Power servitude width	Up to 32m
Height of fencing	Up to 3 meters

Table 2.4 provides the coordinate points for the proposed project site, associated infrastructure and grid connection corridor.

Table 2.4: Coordinates

Coordinates			
Project Site	A	28°33'52.65"S	25°17'29.53"E
Proposed Access Point		28°34'6.76"S	25°17'42.81"E
Grid Connection Corridor	A	28°33'58.88"S	25°17'41.85"E
	B	28°33'58.86"S	25°17'41.86"E
	C	28°33'58.92"S	25°17'41.86"E
	D	28°33'58.95"S	25°17'41.85"E

Substation / switching station	A	28°33'58.68"S	25°17'41.40"E

2.5 PROJECT REQUIREMENTS AND SERVICES PROVISION

The following sections provides information on services required on the site e.g. water, sewage, refuse removal, and electricity.

2.5.1 Employment and Methods for Construction

The construction phase will have a duration of between 9 and 12 months. At the peak of the construction phase approximately 100 employees will be required.

The construction phase involves the installation of the solar PV panels and the entire necessary structural and electrical infrastructure to make the plant operational. In addition, preparation of the soil and improvement of the access roads would continue for most of the construction phase. For array installation, typically vertical support posts are driven into the ground. Depending on the results of the geotechnical report a different foundation method, such as screw pile, helical pile, micro-pile or drilled post/pile could be used. The posts will hold the support structures (tables) on which PV arrays would be mounted. Brackets attach the PV modules to the tables. Trenches are dug for the underground AC and DC cabling and the foundations of the inverter enclosures and transformers are prepared. While cables are being laid and combiner boxes are being installed, the PV tables are erected. Wire harnesses connect the PV modules to the electrical collection systems. Underground cables and overhead circuits connect the Power Conversion Stations (PCS) to the on-site AC electrical infrastructure and ultimately the project's on-site substation.

The construction of a substation would require a survey of the site, site clearing and levelling and construction of access road/s (where required), construction of a level terrace and foundations, assembly, erection, installation and connection of equipment, and rehabilitation of any disturbed areas and protection of erosion sensitive areas.

Ancillary infrastructure will include cabling for the connection to the Bosplaat Rural Substation, workshop and maintenance building, storage and laydown areas, gatehouse, security offices, and other storage areas under roof. The establishment of these facilities/buildings will require the localised clearing of vegetation and levelling of the project site and the excavation of foundations prior to construction.

2.5.2 Water

Adequate provision of water will be a prerequisite for the development. Water for the proposed development will most likely be obtained from the local municipality, or alternatively from ground water resources. The Tokologo Local Municipality has been asked by the Applicant to confirm the water resource availability in the area in order to ensure sustainable water supply, confirmation was received in 2015. A full assessment of the application for water use authorisation will be done at a later stage.

An estimated 1.5 to 2 million litres of water would be required during the construction of the Castor Solar PV Project. Water will be trucked from the nearest licenced water user, the municipality or abstracted from a suitable borehole.

For operations, approximately 500,000 litres (or 500 m^3) of water per annum is proposed to be trucked in from the nearest water source as per a water purchase agreement from a local authorised user or service provider. Drinking water supplied will comply with the SANS:241 quality requirements.

Water saving devices and technologies such as the use of dual flush toilets and low-flow taps, the management of storm water, the capture and use of rainwater from gutters and roofs would be considered by the developer. Furthermore, indigenous vegetation will be used during landscaping and the staff will be trained to implement good housekeeping techniques.

2.5.3 Storm water

To avoid soil erosion, it is recommended that the clearing of vegetation be limited. Storm water management and mitigation measures are included in the Environmental Management Programme (EMPr) – refer to Appendix E.

2.5.4 Sanitation and waste removal

The main wastes expected to be generated by the construction of the Castor Solar PV Project will include general construction waste, hazardous waste (i.e. fuel), and liquid waste (including grey water and sewage). The volumes of waste expected to be generated will not trigger the requirement for a waste management license. Wastes will be managed effectively in order to ensure minimal impacts on the environment. There will be no litter from clearing activities on work sites, at any time and there will be a litter bag on site at the demarcated gathering area, cleared or removed daily and disposed of in an acceptable manner.

Portable chemical toilets will be utilised, that will be serviced privately or by the local municipality. Waste will be disposed at a licensed landfill site. The construction- and hazardous waste will be removed and disposed of at licensed landfill sites accepting such kinds of wastes. During the operation phase household waste will be removed to a licensed landfill site by a private contractor or by the local municipality. The relevant Local Municipality(s) will be contacted, to formally confirm that it has the capacity to provide the proposed development with these services for the lifetime of the project (20 years).

2.5.5 Electricity

During the construction phase of the development electricity will either be generated on site through a small solar system or through the use of generators or the existing Eskom supply on the affected property will be utilised. This will depend on the Engineering, Procurement, and Construction (EPC) contractor appointed. During operation electricity use will be limited and will primarily be related to the lighting of the facility and domestic use. Design measures such as the use of energy saving light bulbs will be considered by the developer. During the day, electricity will be sourced from the photovoltaic plant, and from the electricity connection at night.

2.6 DECOMMISSIONING OF THE FACILITY

The operating period will be 20 years from the commencement date of the operation phase. Thereafter two rights of renewal periods of 40 years and 20 years will be relevant. It is anticipated that new PV technologies and equipment will be implemented, within the scope of the Environmental Authorisation, when influencing the profitability of the solar facility.

A likely extension of the plant's lifetime would involve putting new, more efficient, solar panels on the existing structures to improve the efficiency of the facility as the technology improves. The specifications of these new panels will be the same as the current panels under consideration, but the conversion efficiency of sunlight to energy will be greater (comparable to new computer chips, that are the same, but faster and more efficient). If, for whatever reason the plant halts operations, the Environmental Authorisation and contract with the landowner will be respected during the decommissioning phase.

The decommissioning process will consist of the following steps:

- The PV facility would be disconnected from the Eskom grid.
- The inverters and PV modules would be disconnected and disassembled.
- Concrete foundations (if used) would be removed and the structures would be dismantled.
- Wastewater storage conservancy tank would be responsibly removed and the area would be rehabilitated.
- The underground cables would be unearthed and removed and buildings would be demolished and removed.
- The fencing would be dismantled and removed.
- The roads can be retained should the landowner choose to retain them, alternatively the roads will be removed and the compaction will be reversed.
- Most of the wires, steel and PV modules are recyclable and would be recycled to a reasonable extent. The Silicon and Aluminium in PV modules can be removed and reused in the production of new modules.
- Any rubble and non-recyclable materials will be disposed of at a registered landfill facility.

The rehabilitation of the site would form part of the decommissioning phase. The aim would be to restore the land to its original form (or as close as possible). The rehabilitation activities would include the following:

- Removal of all structures and rubble;
- Breaking up compaction where required, loosening of the soil and the redistribution of topsoil; and
- Restoration of the surface to the original contours and application of hydro seeding.

3 LEGISLATIVE AND POLICY CONTEXT

This section aims to address the following requirements of the regulations:

Appendix 1. (3) A BAR (...) must include-

(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.

3.1 INTRODUCTION

Environmental decision making with regards to solar PV plants and associated infrastructure is based on numerous policy and legislative documents. These documents inform decisions on project level environmental authorisations issued by the National Department of Forestry, Fisheries and the Environment (DFFE) as well as comments from local and district authorities. Moreover, it is significant to note that they also inform strategic decision making reflected in IDPs and SDFs. Therefore, to ensure streamlining of environmental authorisations it is imperative for the proposed activity to align with the principles and objectives of key national, provincial and local development policies and legislation. The following acts and policies and their applicability to the proposed development are briefly summarised:

- The Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996)
- National Environmental Management Act, 1998 (Act No. 107 of 1998) [NEMA]
- The National Energy Act, 2008 (Act 34 of 2008)
- National Water Act, 1998 (Act No. 36 of 1998)
- National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)
- National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004)
- The National Heritage Resources Act, 1999 (Act No. 25 of 1999)
- Conservation of Agricultural Resources Act, 1983 (Act No. 85 of 1983)
- The National Forests Act, 1998 (Act 84 of 1998)
- The White Paper on the Energy Policy of the Republic of South Africa (1998)
- The White Paper on Renewable Energy (2003)
- Integrated Resource Plan (IRP) for South Africa (2010-2030)
- National Development Plan of 2030
- National Infrastructure Plan of South Africa (2012)
- New Growth Path Framework (2010)
- Climate Change Bill (2018)
- Climate Change Bill (2021) – for public comment
- Strategic Integrated Projects (SIPs) (2010 – 2030)

- Strategic Environmental Assessment (SEA) for wind and solar PV Energy in South Africa (2014)
- Free State Provincial Spatial Development Framework (PSDF) (2012)
- Lejweleputswa District Municipality Final Integrated Development Plan (IDP) 2021 – 2022 (2021)
- Tokologo Local Municipality Final Integrated Development Plan 2020/2021 (2021)

The key principles and objectives of each of the legislative and policy documents are briefly summarised in Tables 3.1 and 3.2 to provide a reference framework for the implications for the proposed activity.

3.2 LEGISLATIVE CONTEXT

Table 3.1: Legislative context for the construction of photovoltaic solar facilities

LEGISLATION	ADMINISTERING AUTHORITY	DATE	SUMMARY / IMPLICATIONS FOR PROPOSED DEVELOPMENT
The Constitution of South Africa **(Act No. 108 of 1996)**	National Government	1996	The Constitution is the supreme law of the Republic and all law and conduct must be consistent with the Constitution. The Chapter on the Bill of Rights contains a number of provisions, which are relevant to securing the protection of the environment. Section 24 states that "everyone has the right to (a) an environment that is not harmful to their health or well-being and (b) to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that – (i) prevent pollution and ecological degradation; (ii) promote conservation; and (iii) secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development. The Constitution therefore, compels government to give effect to the people's environmental right and places government under a legal duty to act as a responsible custodian of the country's environment. It compels government to pass legislation and use other measures to protect the environment, to prevent pollution and ecological degradation, promote conservation and secure sustainable development. The development of the Castor Solar PV Project and the aspects related thereto considers the creation of an environment which is not harmful or degraded through the implementation of appropriate mitigation measures.
The National Environmental Management Act **(Act No. 107 of 1998)**	National Department of Environmental Affairs (now known as the Department of Forestry, Fisheries and the Environment) and	1998	NEMA provides for co-operative governance by establishing principles and procedures for decision-makers on matters affecting the environment. An important function of the Act is to serve as an enabling Act for the promulgation of legislation to effectively address integrated environmental management. Some of the principles in the Act are accountability; affordability; cradle to grave management; equity; integration; open information; polluter pays; subsidiary; waste avoidance and minimisation; co-operative governance; sustainable development; and environmental protection and justice.

	the Free State Province Department of Economic, Small Business Development, Tourism and Environmental Affairs (DESTEA)		The mandate for EIA lays with the National Environmental Management Act (107 of 1998) and the EIA Regulations No. 324, 325, 326, and 327 promulgated in terms of Section 24 of NEMA. The EIA Regulations determine that an Environmental Authorisation is required for certain listed activities, which might have a detrimental effect on the environment. The EIA process undertaken for the Castor Solar PV Project is in-line with the requirements of NEMA for the Application for Environmental Authorisation.
The National Energy Act (Act No. 34 of 2008)	Department of Mineral Resources and Energy	2008	One of the objectives of the National Energy Act was to promote diversity of supply of energy and its sources. In this regard, the preamble makes direct reference to renewable resources, including solar: "To ensure that diverse energy resources are available, in sustainable quantities, and at affordable prices, to the South African economy, in support of economic growth and poverty alleviation, taking into account environmental management requirements (…); to provide for (…) increased generation and consumption of renewable energies…" (Preamble). Considering that the Castor Solar PV Project is proposed to make use of PV technology and the solar resource for the generation of electricity, the proposed project is in-line with the Act.
The National Water Act (Act No. 36 of 1998)	Department of Water Affairs (now known as Department of Water and Sanitation)	1998	Sustainability and equity are identified as central guiding principles in the protection, use, development, conservation, management and control of water resources. The intention of the Act is to promote the equitable access to water and the sustainable use of water, redress past racial and gender discrimination, and facilitate economic and social development. The Act provides the rights of access to basic water supply and sanitation, and environmentally, it provides for the protection of aquatic and associated ecosystems, the reduction and prevention of pollution and degradation of water resources. As this Act is founded on the principle that National Government has overall responsibility for and authority over water resource management, including the equitable allocation and beneficial use of water in the public interest, a person can only be entitled to use water if the use is permissible under the Act. Chapter 4 of the Act lays the basis for regulating water use.

			The site is located within the C91C quaternary catchment within the Vaal Water Management Area. Also, should a water use license be required for the project, the National Water Act will be applicable in terms of obtaining the relevant license.
National Environmental Management: Waste Act **(Act No. 59 of 2008)**	National Department Environmental Affairs (DEA) (now known as the Department of Forestry, Fisheries and the Environment)	2008	NEMWA has been developed as part of the law reform process enacted through the White Paper on Integrated Pollution and Waste Management and the National Waste Management Strategy (NWMS). The objectives of the Act relate to the provision of measures to protect health, well-being and the environment, to ensure that people are aware of the impact of waste on their health, well-being and the environment, to provide for compliance with the measures, and to give effect to section 24 of the Constitution in order to secure an environment that is not harmful to health and well-being. Regulations No. R921 (of 2013) promulgated in terms of Section 19(1) of the National Environmental Management: Waste Act (59 of 2008) determines that no person may commence, undertake or conduct a waste management activity listed in this schedule unless a license is issued in respect of that activity. It is not envisaged that a waste permit will be required for the proposed development as no listed activities in terms of waste management are expected to be triggered.
National Environment Management: Air Quality Act **(Act No. 39 of 2004)**	National Department Environmental Affairs (DEA) (now known as the Department of Forestry, Fisheries and the Environment)	2004	The object of this Act is to protect the environment by providing reasonable measures for the protection and enhancement of the quality of air in the Republic; the prevention of air pollution and ecological degradation; and securing ecologically sustainable development while promoting justifiable economic and social development. Regulations No. R248 (of 31 March 2010) promulgated in terms of Section 21(1)(a) of the National Environmental Management Act: Air Quality Act (39 of 2004) determine that an Atmospheric Emission License (AEL) is required for certain listed activities, which result in atmospheric emissions which have or may have a detrimental effect on the environment. The Regulation also sets out the minimum emission standards for the listed activities. It is not envisaged that an Atmospheric Emission License will be required for the proposed development.

The National Heritage Resources Act **(Act No. 25 of 1999)**	South African Heritage Resources Agency (SAHRA)	1999	The Act aims to introduce an integrated and interactive system for the management of heritage resources, to promote good governance at all levels, and empower civil society to nurture and conserve heritage resources so that they may be bequeathed to future generations and to lay down principles for governing heritage resources management throughout the Republic. It also aims to establish the South African Heritage Resources Agency together with its Council to co-ordinate and promote the management of heritage resources, to set norms and maintain essential national standards and to protect heritage resources, to provide for the protection and management of conservation-worthy places and areas by local authorities, and to provide for matters connected therewith. The Act protects and manages certain categories of heritage resources in South Africa. For the purposes of the Heritage Resources Act, a "heritage resource" includes any place or object of cultural significance. In this regard the Act makes provision for a person undertaking an activity listed in Section 28 of the Act to notify the resources authority. The resources authority may request that a heritage impact assessment be conducted if there is reason to believe that heritage resources will be affected. A case file has been opened on SAHRIS for the Castor Solar PV Project (CaseID: 19043) and all relevant documents were submitted for their comments and approval. The Heritage Impact Assessment undertaken for the Castor Solar PV Project is included as Appendix D5, and the Palaeontological Impact Assessment is included as Appendix D6.
Conservation of Agricultural Resources Act (Act No. 85 of 1983)	National and Provincial Government	1983	The objective of the Act is to provide control over the utilisation of the natural agricultural resources of the Republic in order to promote the conservation of the soil, the water sources and the vegetation and the combating of weeds and invader plants; and for matters connected therewith. Consent will be required from the Department of Agriculture, Forestry and Fisheries (now known as the Department of Forestry, Fisheries and the Environment) in order to confirm that the proposed development is not located on high potential agricultural land and to approve the long term lease agreement. A Soils and Agricultural Compliance statement has been undertaken for the Castor Solar PV Project and is included as Appendix D4.

The National Forests Act, 1998 (Act 84 of 1998)	Department of Environmental Affairs (now known as the Department of Forestry, Fisheries and the Environment)	1998	The purposes of this Act are to: (a) promote the sustainable management and development of forests for the benefit of all; (b) create the conditions necessary to restructure forestry in State forests; (c) provide special measures for the protection of certain forests and trees: (d) promote the sustainable use of forests for environmental, economic, educational, recreational, cultural, health and spiritual purposes. (e) promote community forestry; (f) promote greater participation in all aspects of forestry and the forest products industry by persons disadvantaged by unfair discrimination. Section 12(1) read with s15(1) of the NFA stated that the Minister may declare a particular tree, group of trees, woodland; or trees belonging to a particular species, to be a protected tree, group of trees, woodland or species. A list of protected tree species was gazetted in GN 635 of 6 December 2019. The effect of the declaration is that no person may (a) cut, disturb, damage or destroy; or (b) possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, or any forest product derived from a protected tree, except under a license granted by the Minister; or in terms of an exemption published by the Minister in the Gazette. A Terrestrial Ecology Impact Assessment has been undertaken for the Castor Solar PV Project and is included in Appendix D1.

3.3 POLICY CONTEXT

Table 3.2: Policy context for the construction of solar PV facilities

POLICY	ADMINISTERING AUTHORITY	DATE	SUMMARY / IMPLICATIONS FOR PROPOSED DEVELOPMENT
The White Paper on the Energy Policy of the Republic of South Africa	Department of Mineral Resources and Energy	1998	The White Paper on the Energy Policy of the Republic of South Africa establishes the international and national policy context for the energy sector, and identifies the following energy policy objectives: ● Increasing access to affordable energy services ● Improving energy governance ● Stimulating economic development ● Managing energy-related environmental and health impacts ● Securing supply through diversity ● Energy policy priorities The White Paper sets out the advantages of renewable energy and states that Government believes that renewables can in many cases provide the least cost energy service, particularly when social and environmental costs are included. The White Paper acknowledges that South Africa has neglected the development and implementation of renewable energy applications, despite the fact that the country's renewable energy resource base is extensive, and many appropriate applications exist. The White Paper notes that renewable energy applications have specific characteristics that need to be considered. Advantages include: ● Minimal environmental impacts in operation in comparison with traditional supply technologies; and ● Generally lower running costs, and high labour intensities. Disadvantages include: ● Higher capital costs in some cases; ● Lower energy densities; and

			• Lower levels of availability, depending on specific conditions, especially with sun and wind-based systems. The Castor Solar PV Project is in line with this policy as it proposes the generation of renewable energy from the solar resource.
The White Paper on Renewable Energy	Department of Mineral Resources and Energy	2003	This White Paper on Renewable Energy supplements the *White Paper on Energy Policy*, which recognises that the medium and long-term potential of renewable energy is significant. This Paper sets out Government's vision, policy principles, strategic goals and objectives for promoting and implementing renewable energy in South Africa. The White Paper notes that while South Africa is well-endowed with renewable energy resources that have the potential to become sustainable alternatives to fossil fuels, these have thus far remained largely untapped. Government's long-term goal is the establishment of a renewable energy industry producing modern energy carriers that will offer in future years a sustainable, fully non-subsidised alternative to fossil fuels. The medium-term (10-year) target set in the White Paper is: *10 000 GWh (0.8 Mtoe) renewable energy contribution to final energy consumption by 2013, to be produced mainly from biomass, wind, solar and small-scale hydro. The renewable energy is to be utilised for power generation and non-electric technologies such as solar water heating and bio-fuels. This is approximately 4% (1667 MW) of the projected electricity demand for 2013 (41539 MW)* (Executive Summary, ix). The Castor Solar PV Project is in line with this paper as it proposes the generation of renewable energy from the solar resource.
Integrated Resource Plan (IRP) for South Africa	Department of Mineral Resources and Energy	2010-2030	The Integrated Resource Plan for Electricity for South Africa of 2010–2030 (further referred to as the IRP) is a "living plan" which is expected to be revised and updated continuously as necessary due to changing circumstances. According to the Summary of the plan the current IRP for South Africa, which was originally initiated by the Department of Energy (DoE) in June 2010 (the Department is now known as Department of Mineral Resources and Energy), led to the Revised Balanced Scenarios (RBS) for the period 2010–2030. "*This scenario was derived based on the cost-optimal solution for new build options (considering the direct costs of new build power plants), which was then "balanced" in accordance with qualitative measures such as local job creation".* In addition to all existing and committed power plants, the RBS included 11,4 GW of renewables, which relates to the proposed Castor Solar PV Project. In 2010 several changes were made to the IRP model. The main

changes in the IRP were the disaggregation of renewable energy technologies to explicitly display solar photovoltaic (PV), concentrated solar power (CSP), and wind options (RSA, 2011a).

The summary of the IRP further explains that traditional cost-optimal scenarios were developed based on the previously mentioned changes in the IRP. This resulted in the Policy-Adjusted IRP, which stated that:

"*The installation of renewables (solar PV, CSP and wind) have been brought forward in order to accelerate a local industry*; *To account for the uncertainties associated with the costs of renewables and fuels, a nuclear fleet of 9,6 GW is included in the IRP; The emission constraint of the RBS (275 million tons of carbon dioxide per year after 2024) is maintained; and Energy efficiency demand-side management (EEDSM) measures are maintained at the level of the RBS*" (RSA, 2011a:6).

"The Policy-Adjusted IRP includes the same amount of coal and nuclear new builds as the RBS, while reflecting recent developments with respect to prices for renewables. In addition to all existing and committed power plants (including 10 GW committed coal), the plan includes 9,6 GW of nuclear; 6,3 GW of coal; 17,8 GW of renewables; and 8,9 GW of other generation sources" (RSA, 2011a:6).

The IRP highlights the commitments before the next IRP. The commitments pertaining to the purpose of the proposed project in renewable energy is: "*Solar PV programme 2012-2015: In order to facilitate the connection of the first solar PV units to the grid in 2012 a firm commitment to this capacity is necessary. Furthermore, to provide the security of investment to ramp up a sustainable local industry cluster, the first four years from 2012 to 2015 require firm commitment."*

"*Solar PV 2016 to 2019: As with wind, grid upgrades might become necessary for the second round of solar PV installations from 2016 to 2019, depending on their location. To trigger the associated tasks in a timely manner, a firm commitment to these capacities is necessary in the next round of the IRP at the latest. By then, the assumed cost decreases for solar PV will be confirmed*" (IRP, 2011a:17).

In conclusion the IRP recommends that an accelerated roll-out in renewable energy options should be allowed with regards to the benefits of the localization in renewable energy technologies (RSA, 2011a). It is however important to take note that since the release of the IRP in 2011 there has been a number of developments in the energy sector of South Africa. Therefore, the IRP was updated and was open for comments until March of 2017. The new IRP of

2019 was formally published in October 2019. For the revision scenario, analysis was conducted. The results revealed that for the period ending 2030 that: *"The committed Renewable Energy Independent Power Producers Programme, including the 27 signed projects and Eskom capacity rollout ending with the last unit of Kusile in 2022, will provide more than sufficient capacity to cover the projected demand and decommissioning of plants up to approximately 2025"; "Imposing annual build limits on renewable energy will not affect the total cumulative capacity and the energy mix for the period up to 2030*"; and *"the scenario without renewable energy annual build limits provides the least-cost option by 2030*" (RSA, 2018:34).

Lastly, the draft IRP of 2018 also included the scenario analysis for the period post 2030. Here it was observed that: "*Imposing annual build limits on renewable energy will restrict the cumulative renewable installed capacity and the energy mix for this period; adopting no annual build limits on renewables or imposing a more stringent strategy to reduce greenhouse gas emissions implies that no new coal power plants will be built in the future unless affordable cleaner forms of coal-to-power are available; and the scenario without renewable energy annual build limits provides the least-cost option by 2050*" (RSA, 2018:34–35).

In the final IRP of 2019 key considerations were taken into account together with required actions to be taken for the IRP of 2019 to be credible. In terms of renewable energy technologies like solar and wind, the IRP stated that *"The application of renewable build limits 'smoothes out' the capacity allocations for wind and solar PV which provides a constant pipeline of projects to investment; this addresses investor confidence*". The decision stated against this key consideration is to *"retain the current annual build limits on renewables (wind and PV) pending the finalization of a just transition plan"* (RSA, 2019:46). Hereby the IRP also recognises renewable technologies' potential to diversify the electricity mix, create new industries and job opportunities and localize across the value chain (RSA, 2019:13).

The Castor Solar PV Project is in line with this plan as it proposes the generation of renewable energy from the solar resource and will contribute to the energy mix of the country as set out in this plan.

National Development Plan of 2030	The Presidency: National Planning Commission	-	The National Development Plan aims to "eliminate poverty and reduce inequality by 2030" (RSA, undated). In order to eliminate or reduce inequality, the economy of South Africa needs to grow faster in order to benefit all South Africans. In May 2010 a draft national development plan was drafted, which highlighted the nine (9) key challenges for South Africa. The highest priority areas according to the plan are considered to be the creation of employment opportunities and to improve the quality of national education. In this regard, the plan sets out three (3) priority areas, namely, to raise employment by a faster growing economy, improve the quality of education, and to build the capability of the state in order to play a more developmental and transformative role. One of the key challenges identified was that the economy is unsustainably resource intensive and the acceleration and expansion of renewable energy was identified as a key intervention strategy to address this challenge. The development of the Castor Solar PV Project will contribute to the intervention strategy as identified within the plan.
National Infrastructure Plan of South Africa	Presidential Infrastructure Coordinating Commission	2012	In the year 2012 the South African Government adopted a National Infrastructure Plan (hereafter referred to as the Plan). The aim of this Plan is to transform the economic landscape, while strengthening the delivery of basic services and creating new employment opportunities. This Plan also supports the integration of African communities, and also sets out the challenges and enablers that our country needs in order to respond to the planning and development of infrastructure with regards to fostering economic growth (RSA, 2012). The Plan has developed eighteen (18) strategic integrated projects (further referred to as SIPs). These SIPs stretch over all nine (9) provinces, covering social and economic infrastructure, and projects that enhances development and growth. Of the eighteen (18), five (5) are geographically focused, three (3) spatial, three (3) energy, three (3) social infrastructure, two (2) knowledge, one (1) regional integration, and one (1) water and sanitation focussed. The three (3) SIPs according to the Plan, which are energy focused and correlate to the proposed project are as follow: - SIP 8: Green energy in support of the South African economy; - SIP 9: Electricity generation to support socio-economic development; and - SIP 10: Electricity transmission and distribution for all. SIP 8 according to the Plan "*support sustainable green energy initiatives on a national scale through a diverse range of clean energy options as envisaged in the IRP 2010 and support bio-fuel production facilities*". The purpose of SIP

			9 according to the Plan is to "*accelerate the construction of new electricity generation capacity in accordance with the IRP 2010 to meet the needs of the economy and address historical imbalances*". SIP 9 should also monitor the implementation of major projects such as new power stations like Medupi, Kusile and Ingula. Lastly, SIP 10 aims to "*expand the transmission and distribution network to address historical imbalances, provide access to electricity for all and support economic development*" (RSA, 2012:20). The Castor Solar PV Project is in line with this plan as it proposes the generation of renewable energy from the solar resource which supports socio-economic development and will contribute to meeting the electricity demand of the country as set out in this plan.
New Growth Path Framework	Department of Economic Development	-	The New Growth Path was developed after 16 years of South Africa's democracy, to respond to emerging opportunities and risks while building on policies. This framework provides a dynamic vision on how to collectively achieve a more developed, equitable and democratic society and economy. This framework mainly reflects the commitment of the South African Government to create employment opportunities for its people in all economic policies (RSA, 2011b). This framework sets out the markers for job creation and growth and also identify where there are viable changes in the character and structure of production, in order to create a more inclusive, greener economy in the long-term. It is stated in the framework that in order for this framework to reach its objectives, the Government is committed to: - Identify the possible areas of employment creation; and - Develop a policy to facilitate employment creation especially with regards to social equity, sustainable employment and growth in the creation of employment activities (RSA, 2011b). This framework also identifies investments in five key areas, one of which is energy. This framework also states that the green economy is a priority area, which includes the construction of and investment in renewable energy technologies like solar (RSA, 2011b). In this regard it will also assist creating employment opportunities over the medium- and long-term.

			Considering that the construction of and investment in renewable energy is a key area identified within the framework, the Castor Solar PV Project is considered to be in-line with the framework.
Climate Change Bill	National Department of Environmental Affairs (now known as the Department of Forestry, Fisheries and the Environment)	2018	On 08 June 2018 the Minister of Environmental Affairs published the Climate Change Bill ("the Bill") for public comment. The Bill provides a framework for climate change regulation in South Africa aimed at governing South Africa's sustainable transition to a climate resilient, low carbon economy and society. The Bill provides a procedural outline that will be developed through the creation of frameworks and plans. The following objectives are set within the Bill: ● Provide for the coordinated and integrated response to climate change and its impacts by all spheres of government in accordance with the principles of cooperative governance; ● Provide for the effective management of inevitable climate change impacts through enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change, with a view to building social, economic, and environmental resilience and an adequate national adaptation response in the context of the global climate change response; ● Make a fair contribution to the global effort to stabilise greenhouse gas concentrations in the atmosphere at a level that avoids dangerous anthropogenic interference with the climate system within a timeframe and in a manner that enables economic, employment, social and environmental development to proceed in a sustainable manner. The Castor Solar PV Project comprises a renewable energy generation facility and would not result in the generation or release of emissions during its operation.
Climate Change Bill	National Department of Forestry, Fisheries and the Environment	2021	The Department of Forestry, Fisheries and the Environment has published a new Climate Change Bill for public comment. The bill notes that climate change represents an urgent threat to human societies and the planet, and requires an effective, progressive and incremental response from both government and citizens. It recognises that South Africa has a global responsibility to reduce greenhouse gasses and that the anticipated impacts arising as a result of climate change have the potential to undermine achieving of the country's developmental goals.

			The main objective of the bill is to enable the development of an effective climate change response and the long-term, just transition to a climate-resilient and lower-carbon economy and society, and to provide for matters connected therewith. The Castor Solar PV Project comprises a renewable energy generation facility and would not result in the generation or release of emissions during its operation.
Strategic Integrated Projects (SIPs)	The Presidential Infrastructure Coordinating Committee	2010 - 2030	The Presidential Infrastructure Coordinating Committee (PICC) is integrating and phasing investment plans across 18 Strategic Infrastructure Projects (SIPs) which have five core functions: to unlock opportunity, transform the economic landscape, create new jobs, strengthen the delivery of basic services and support the integration of African economies. A balanced approach is being fostered through greening of the economy, boosting energy security, promoting integrated municipal infrastructure investment, facilitating integrated urban development, accelerating skills development, investing in rural development and enabling regional integration. SIP 8 and 9 of the energy SIPs supports the development of the solar energy facility: ● SIP 8: Green energy in support of the South African economy: Support sustainable green energy initiatives on a national scale through a diverse range of clean energy options as envisaged in the Integrated Resource Plan (IRP 2010 – 2030) and supports bio-fuel production facilities. ● SIP 9: Electricity generation to support socio-economic development: The proposed Castor Solar PV Project is a potential SIP 9 Project as electricity will be generated and social and economic upliftment, development and growth will take place within the surrounding communities. It would become a SIP 9 project if selected as a Preferred Bidder project by the Department of Mineral Resources and Energy. SIP 9 supports the acceleration of the construction of new electricity generation capacity in accordance with the IRP 2010 to meet the needs of the economy and address historical imbalances. The Castor Solar PV Project could be registered as a SIP project once selected as a preferred bidder under the REIPPP Programme. The project would then contribute to the above-mentioned SIPs

Strategic Environmental Assessment (SEA) for wind and solar PV Energy in South Africa	National Department of Environmental Affairs (now known as the Department of Forestry, Fisheries and the Environment)	2014	The then Department of Forestry, Fisheries and the Environment (DFFE) has committed to contribute to the implementation of the National Development Plan and National Infrastructure Plan by undertaking Strategic Environmental Assessments (SEAs) to identify adaptive processes that integrate the regulatory environmental requirements for Strategic Integrated Projects (SIPs) while safeguarding the environment. The wind and solar photovoltaic (PV) SEA was accordingly commissioned by DEA in support of SIP 8, which aims to facilitate the implementation of sustainable green energy initiatives. This SEA identifies areas where large scale wind and solar PV energy facilities can be developed in terms of SIP 8 and in a manner that limits significant negative impacts on the environment, while yielding the highest possible socio-economic benefits to the country. These areas are referred to as Renewable Energy Development Zones (REDZs). The REDZs also provide priority areas for investment into the electricity grid. Currently one of the greatest challenges to renewable energy development in South Africa is the saturation of existing grid infrastructure and the difficulties in expanding the grid. Proactive investment in grid infrastructure is likely to be the most important factor determining the success of REDZs. Although it is intended for the SEA to facilitate proactive grid investment in REDZs, such investment should not be limited to these areas. Suitable wind and solar PV development should still be promoted across the country and any proposed development must be evaluated on its own merit. The Castor Solar PV Project located within the Kimberley REDZ, and will therefore contribute to the expansion of renewable energy facilities and infrastructure within the country, and provide the positive opportunities associated with it.
Free State Provincial Spatial Development Framework (PSDF)	Free State Provincial Government	2012	The Free State PSDF is a policy document that promotes a 'developmental state' in accordance with national and provincial legislation and directives. It aligns with the Free State Provincial Growth and Development Strategy which has committed the Free State to 'building a prosperous, sustainable and growing provincial economy which reduces poverty and improves social development'. The PSDF includes comprehensive plans and strategies that collectively indicate which type of land-use should be promoted in the Province, where such land-use should take place, and how it should be implemented and managed. In broad terms, the PSDF:

			• Indicates the spatial implications of the core development objectives of the Free State Provincial Growth and Development Strategy. • Serves as a spatial plan that facilitates local economic development. • Lays down strategies, proposals and guidelines as it relates to sustainable development. • Facilitates cross-boundary co-operation between municipalities, adjoining provinces, and bordering countries. • Serves as a manual for integration and standardisation of the planning frameworks of all spheres of government in the Province. The Free State Provincial Growth and Development Strategy states that sustainable economic development is the only effective means by which the most significant challenge of the Free State, namely poverty, can be addressed is. The PSDF gives practical effect to sustainable development, which is defined as development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs. The PSDF is prepared in accordance with bioregional planning principles that were adapted to suit the site-specific requirements of the Free State. It incorporates and complies with the relevant protocols, conventions, agreements, legislation and policy at all applicable levels of planning, ranging from the international to the local. The PSDF builds upon achievements and learns from mistakes of the past, reacts to the challenges of our time, incorporates the traditional knowledge of the people of the Free State, and builds upon international best-practice and technology. The development of the Castor Solar PV Project is in-line with the framework based on the contributions and opportunities presented by a development of this nature.
Lejweleputswa District Municipality Integrated Development Plan (IDP)	Lejweleputswa District Municipality	2021-2022	The long-term vision of the Lejweleputswa DM is to be: “A leader in sustainable development and service delivery to all”. The above stated vision defines what Lejweleputswa District Municipality would like to attain over medium to long-term, and for that achievement to effectively materialize, their mission is: “Providing sound financial management. Providing excellent, vibrant public participation and high quality local municipal support programmes by

			maintaining good working relations in the spirit of co-operative governance, and enhancing high staff morale, productivity and motivation". The IDP identified specific objectives, strategies and projects for the district as per the District Rural Development Plan and the District Rural Development Implementation Plan. Key Performance Area 3 relates to Local Economic Development and lists that the development of a solar plant as one of the Municipal Focus Areas with the objective to revive the regional economy of the District Municipality with the intention of creating sustainable economies. The development of the Castor Solar PV Project is in line with the plan, considering the relevant Key Performance Area stated in the IDP.
Tokologo Local Municipality Final Integrated Development Plan (IDP)	Tokologo Local Municipality	2021	The Integrated Development Plan (IDP) (2020-2021) of the Local Municipality identifies critical issues experienced within the area, which includes electricity reticulation. The IDP has set an objective to ensure that 90% of the households in the municipal area have electricity by end 2020/21, with the outcome of the objective being that 90% of households in formal areas with access to electricity. However, as there is no updated IDP available for the year 2022 it is not clear whether this critical issue has been dealt with and the goals reached in this regard. The development of the Castor Solar PV Project will increase the supply of electricity available in the national electricity grid and will therefore contribute to the objective of the municipality, albeit to a limited extent.

3.4 OTHER LEGISLATION

Other legislation mainly refers to the following:

- Planning legislation governing the rezoning process and approval of the layout plan.
- Design standards and legislation for services provision such as water, sewerage, electricity, etc.
- Municipal bylaws related to building plans, building regulations, etc.

3.5 RELEVANT GUIDANCE

The following guidance was considered in conducting the BA:

- The Equator principles III (2013)[2]
- World Bank Group Environmental, Health and Safety General Guidelines (EHS Guidelines) (2007)
- Environmental, Health, and Safety Guidelines for Electric Power Transmission and Distribution (2007)
- International Finance Corporation's Policy on Environmental and Social Sustainability (2012)
- DEA. (2013). Draft National Renewable Energy Guideline. Department of Environmental Affairs, Pretoria, South Africa
- DEA, (2012), Guideline 5 – Final companion to the National Environmental Management Act (NEMA) Environmental Impact Assessment (EIA) Regulations of 2010
- DEA, (2012), Guideline 7 – Public participation in the Environmental Impact Assessment process
- DEA, (2012), Guideline 9 – Need and desirability
- DEAT, (2006), Guideline 3 – General guide to the Environmental Impact Assessment Regulations
- DEAT, (2006), Guideline 4 – Public participation in support of the Environmental Impact Assessment Regulations
- DEAT, (2006), Guideline 5 – Assessment of alternatives and impacts in support of the Environmental Impact Assessment Regulations
- BirdLife, (2017). Best Practise Guidelines Birds & Solar Energy: Guidelines for assessing and monitoring the impact of solar power generating facilities on bird in southern Africa.

[2] Although this report is not written in terms of the Equator Principles (EPs), it fully acknowledges that the EPs will need to be complied with should funding for the project be required.

3.6 CONCLUSION

The Basic Assessment was undertaken in accordance with the EIA Regulations (2017) published in GNR 326, in terms of Section 24(5) and 44 of the NEMA as amended as well as all relevant National legislation, policy documents, national guidelines, the World Bank EHS Guidelines, the IFC Performance Standards, and the Equator Principles.

The legislative and policy context plays an important role in identifying and assessing the potential social impacts associated with the proposed development. For this reason, the proposed development project will be assessed and has been considered in terms of its fit with the key legislative, policy and planning documents discussed above.

The main findings of the review of the policy documents on all spheres of Government indicated that strong support was given towards renewable energy, specifically PV solar energy and therefore it is concluded that there is support for the development of the Castor Solar PV Project in the proposed location. The White Paper on the Energy Policy of the Republic of South Africa of 1998 stated that due to the fact that renewable energy resources operate from an unlimited resource base, i.e. the sun, renewable energy can increasingly contribute towards a long-term sustainable energy supply for future generations. This policy further highlights that due to the unlimited resources base of renewable energy in South Africa, renewable energy applications like PV solar energy and associated infrastructure are more sustainable in terms of social and environmental costs. The Integrated Resource Planning for Electricity for South Africa of 2010–2030, the National Infrastructure Plan of South Africa and the New Growth Path Framework all support the development of the renewable energy sector. In particular, the IRP also indicated that 43% of the energy generations in South Africa is allocated to renewable energy applications. On a District and Local level limited attention is given explicitly to renewable sources like PV solar energy, however the documents reviewed do make provision for the need for increased energy supply and efficiency in improving the quality of lives in terms of efficient physical infrastructure as well as socio-economic growth. At Provincial, District and Local level the policy documents indirectly support the applications of renewables as it will contribute to surety of electricity supply and improving the lives of the community.

The review of the relevant policies and documents related to the energy sector therefore indicate that renewables, like solar energy and the establishment of solar energy facilities and associated infrastructure, are supported on all spheres of Government. The support for development of such a nature also contributes to the need and desirability of the proposed project.

The proposed Castor Solar PV Project is therefore supported by the related policy and planning documents reviewed in this section of the report.

4 THE NEED AND DESIRABILITY

This section aims to address the following requirements of the regulations:

Appendix 1. (3) An BAR (...) must include-

(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 location;

4.1 THE NEED FOR THE PROPOSED ACTIVITY

The proposed activity is a direct result of the growing demand for electricity and the need for renewable energy in South Africa. According to Eskom, the demand for electricity in South Africa has been growing at approximately 3% per annum. This growing demand, fuelled by increasing economic growth and social development, is placing increasing pressure on South Africa's existing power generation capacity. Coupled with this, is the growing awareness of environmentally responsible development, the impacts of climate change and the need for sustainable development.

Over 90% of South Africa's electricity generation is coal based, the Word bank estimates that this results in an annual, per capita carbon emission of ~8.9 tons per person. Based on 2008 fossil-fuel CO_2 emissions statistics released by the Carbon Dioxide Information Analysis Centre, South Africa is the 13th largest carbon dioxide emitting country in the world and the largest emitter in Africa (Boden, et al. 2011). In August 2021 an article confirmed that South Africa is the 12th highest greenhouse gas emitter in the world (source: https://www.news24.com/fin24/economy/eskom-will-only-able-to-meet-global-air-quality-standards-by-2050-owing-to-financial-woes-20210818).

The proposed project is intended to form part of the Department of Mineral Resources and Energy's (DMREs) Renewable Energy Independent Power Producer Procurement (REIPPP) Programme or any other appropriate energy generation programmes / opportunities. The REIPPP Programme aims to secure 14 725 Megawatts (MW) of new generation capacity from renewable energy sources, while simultaneously diversifying South Africa's electricity mix. According to the 2021 State of the Nation Address, Government will soon be initiating the procurement of an additional 11 800 MW of power from renewable energy, natural gas, battery storage and coal in line with the Integrated Resource Plan 2019 and fulfilling their commitments under the United Nations Framework Convention on Climate Change and its Paris Agreement which include the reduction of greenhouse gas emissions. Eskom, the largest greenhouse gas emitter of South Africa, has committed in principle to net zero emission by 2050 and to increase its renewable capacity. During the 2022 State of the Nation Address it was indicated that during the past year the government had taken "firm steps" to bring additional generation capacity online as quickly as possible to close the shortfall in terms of electricity. As a result it was confirmed that several new generation projects will be coming online over the next few years.

Besides capacity additions, several assumptions have changed since the promulgation of the IRP 2010–2030. Key assumptions that changed include the electricity demand projection, Eskom's existing plant performance, as well as new technology costs. These changes necessitated the review and update of the IRP which resulted in the draft IRP 2018 as per table 4.1 below:

Table 4.1: Published Draft IRP 2018 (Approved by Cabinet for Consultation)

	Coal	Nuclear	Hydro	Storage (Pumped Storage)	PV	Wind	CSP	Gas / Diesel	Other (CoGen, Biomass, Landfill)	Embedded Generation
2018	39 126	1 860	2 196	2 912	1 474	1 980	300	3 830	499	Unknown
2019	2 155					244	300			200
2020	1 433				114	300				200
2021	1 433				300	818				200
2022	711				400					200
2023	500									200
2024	500									200
2025					670	200				200
2026					1 000	1 500		2 250		200
2027					1 000	1 600		1 200		200
2028					1 000	1 600		1 800		200
2029					1 000	1 600		2 850		200
2030			2 500		1 000	1 600				200
TOTAL INSTALLED	33 847	1 860	4 696	2 912	7 958	11 442	600	11 930	499	2600
Installed Capacity Mix (%)	44.6	2.5	6.2	3.8	10.5	15.1	0.9	15.7	0.7	

Installed Capacity
Committed / Already Contracted Capacity
New Additional Capacity (IRP Update)

According to the South African Energy Sector Overview (2021), there is currently 1 723MW of installed PV capacity, while an additional 2 600MW from wind and solar has been rewarded as part of Bid Window 5.

The need for the Castor Solar PV Project is therefore evident considering the above. Furthermore, an Environmental Authorisation was previously obtained on the affected property for the proposed Boshof – Les Marais / Buitefontein Solar Energy Facility under the DEA (Department of Environmental Affairs) Reference number 14/12/16/3/3/1/1090). This EIA process was concluded in March 2014 and the project received EA on 10 July 2014. This project was quite small and only catered for the generation of up to 5MW of electricity. The EA of this development lapsed on 14 July 2021 and is therefore no longer available for development. With the rapid growth of the need for renewable energy in the country and considering the changes in the renewable energy sector since 2014 the Applicant is now proposing the development of the Castor Solar PV Project which will produce more than double the capacity as the previously authorised Boshof – Les Marais / Buitefontein Solar Energy Facility. As the development of a solar energy facility was previously authorised on the same affected property the need for the development is strengthened, especially with the Castor Solar PV Project being of an increased capacity in an economic climate requiring urgent and rapid electricity supply.

4.2 THE DESIRABILITY OF THE PROPOSED ACTIVITY

The facility's contribution towards sustainable development and the associated benefits to society in general is discussed below:

- Lesser dependence on fossil fuel generated power - The deployment of the facility will have a positive macro-economic impact by reducing South Africa's dependence on fossil fuel generated power and assisting the country in meeting its growing electricity demand.

- Increased surety of supply - By diversifying the sources of power in the country, the surety of supply will increase. The power demands of South Africa are ever increasing and by adding solar power this demand can be met, even exceeded without increasing pollution in relation to the use of fossil fuels. The Castor Solar PV Project has the potential of "securing" economic activity by assisting in removing supply constraints if Eskom generation activities result in a supply shortfall. When supply is constrained, it represents a limitation to economic growth. When a supply reserve is available, it represents an opportunity for economic growth.
- Local economic growth - The Castor Solar PV Project will contribute to local economic growth by supporting industry development in line with provincial and regional goals and ensuring advanced skills are drawn to the Free State Province. The project will likely encounter widespread support from government, civil society and businesses, all of whom see potential opportunities for revenues, employment and business opportunities locally. The development of the photovoltaic solar facility will in turn lead to growth in tax revenues for local municipalities and sales of carbon credits, resulting in increased foreign direct investment.
- Lower costs of alternative energy - An increase in the number of solar facilities commissioned will eventually reduce the cost of the power generated through solar facilities. This will contribute to the country's objective of utilising more renewable energy and less fossil fuel-based power sources. It will assist in achieving the goal to generate 14 725 MW of electricity from renewable energy as per the Renewable Energy Independent Power Producer Procurement (REIPPP) Programme of the Department of Mineral Resources and Energy. The Government will be initiating the procurement of additional renewable energy.
- Reduction in greenhouse gas emissions - The additional power supplied through solar energy will reduce the reliance on the combustion of fossil fuels to produce power. The South African electricity grid is predominantly coal-fired and therefore Greenhouse Gas (GHG) emissions intensive (coal accounts for more than 92% of the fuel used in South Africa's electricity generation). The reduction of GHG emissions as a result of the project implementation will be achieved due to reduction of CO_2 emissions from combustion of fossil fuels at the existing grid-connected power plants and plants which would likely be built in the absence of the project activity.
- CDM Project - A solar energy facility also qualifies as a Clean Development Mechanism (CDM) project (i.e. a financial mechanism developed to encourage the development of renewable technologies).
- Climate change mitigation - On a global scale, the project makes a contribution to greenhouse gas emission reduction and therefore contributes toward climate change mitigation.
- Reduced environmental impacts - The reduction in electricity consumed from the grid will not only result in a reduction in greenhouse gas emissions, but also the prevention of negative impacts associated with coal mining. For example, coal power requires high volumes of water, in areas of South Africa where water supply is already over-stretched and water availability is highly variable. Photovoltaic solar energy technology also does not produce the sulphur emissions, ash or coal mining concerns associated with conventional coal fired electricity generation technologies resulting in a relatively low level of environmental impacts. It is a clean technology which contributes toward a better-quality environment for employees and nearby communities.

- Social benefits - The project activity is likely to have significant long-term, indirect positive social impacts that may extend to a regional and even national scale. The larger scale impacts are to be derived in the utilisation of solar power and the experience gained through the construction and operation of the power plant. In future, this experience can be employed at other similar solar installations in South Africa.
- Provision of job opportunities - The main benefit of the proposed development operating in the area is that local companies or contractors will be hired for the duration of the construction period. The operational phase will provide permanent job opportunities to the local communities from the surrounding area since security guards and general labourers will be required on a full-time basis. Approximately 100 employment opportunities will be created during the construction phase and 10 during the operation phase.
- Indirect socio-economic benefits - The increase in the demand for services such as accommodation, transportation, security, general maintenance and catering will generate additional indirect socio-economic benefits for the local community members.
- Effective use of resources - The site is associated with non-arable lands. The available climate limits crop production significantly. The harsh climatic conditions are associated with low annual rainfall and high evapotranspiration potential demands of the area, which consequently result in a very restricted choice of crops due to the heat and moisture stress. The area is not favourable for most cropping practices, which corresponds to the current livestock and game farming activities in the area. The proposed development in this specific area will generate alternative land use income through rental for the Castor Solar PV Project, which will have a positive impact on the current agricultural activities. It will provide the farming enterprise with increased cash flow and rural livelihood, and thereby improve the financial sustainability of agricultural activities by the landowner.
- Location of the activity within a REDZ - The Renewable Energy Development Zones (REDZ) have a key role to play in the South Africa's just energy transition. The REDZ create priority areas for investment in the electricity grid. Since the site is located within a REDZ it contributes to the desirability of the project.
- Cumulative impacts of low to medium significance – No cumulative impacts with a high residual risk have been identified. In terms of the desirability of the development it may be preferable to incur a higher cumulative loss in such a region as this one (i.e. on land considered as non-arable and with limited sensitive environmental features), than to lose land with a higher environmental value elsewhere in the country.

5 DESCRIPTION OF ENVIRONMENTAL ISSUES

.

This section aims to address the following requirements of the regulations:

Appendix 1. (3) A BAR (...) must include-

(g) A motivation for the preferred site, activity and technology alternative;

(h) a full description of the process followed to reach the proposed preferred alternative, within the site, including –

(i) details of all the alternatives considered;

(ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs;

(iii) a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them;

(iv) the environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;

(viii) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks associated with the alternatives;

(x) if no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such; and

(xi) a concluding statement indicating the preferred alternative development location within the approved site.

5.1 CONSIDERATION OF ALTERNATIVES

The DFFE 2006 guidelines on 'assessment of alternatives and impacts' proposes the consideration of four types of alternatives namely, the no-go, location, activity, and design alternatives. It is, however, important to note that the regulation and guidelines specifically state that only 'feasible' and 'reasonable' alternatives should be explored. It also recognizes that the consideration of alternatives is an iterative process of feedback between the developer and EAP, which in some instances culminates in a single preferred project proposal.

The Applicant has considered the affected property prior to the commencement of the Basic Assessment process to determine whether the property would be suitable for the development of a up to 20MW solar energy facility. The site was found to be favourable due to its proximity to a grid connection point (located within the affected property), the opportunity to reduce grid connection infrastructure to enable the evacuation of the generated electricity, environmental conditions, relatively flat terrain, high solar radiation values and adequate site access. Also, the findings of the previous Basic Assessment process for the proposed Boshof – Les Marais / Buitefontein Solar Energy Facility (DEA reference number 14/12/16/3/3/1/1090) was also considered by the Applicant to further confirm the

suitability of the site. This proposed project received Environmental Authorisation, which has however since lapsed.

Some areas of the property are deemed as important by the landowner for the current agricultural activities which has been considered and subsequently avoided by the placement of the site / area under assessment by the Applicant. This selection process ensures that the site/area under assessment is feasible from an availability and technical perspective.

The following sections explore different types of alternatives in relation to the proposed project in more detail.

5.1.1 No-go alternative

This alternative considers the option of 'do nothing' and maintaining the status quo. The description provided in section 5.3 of this report could be considered the baseline conditions (status quo) to persist should the no-go alternative be preferred. The site is currently zoned for mixed land uses, and agricultural activities such as grazing and game farming are undertaken within the affected property (with limited options of crop production due to climatic and moisture limitations and challenges). Should the proposed activity not proceed, the site will remain unchanged and will continue to be used for grazing and game farming, with no other opportunity for further agricultural activities other than grazing or game farming based on the soils of the property. The potential opportunity costs in terms of alternative land use income through rental for the energy facility and the supporting social and economic development in the area would be lost if the status quo persists. The development of the Castor Solar PV Project provides an opportunity to develop and undertake a land use not currently available to the landowner which will benefit not only the landowner but also the current agricultural activities.

5.1.2 Location alternatives

This alternative asks the question, if there is not, from an environmental perspective, a more suitable location for the project. No other properties have at this stage been secured by Castor Solar PV Project (Pty) Ltd in the Boshof area to potentially establish the solar energy facility. This is also based on the fact that a solar energy facility was previously authorised on the same property for development (as previously discussed). From a local perspective, Portion 1 of the Farm Merriesfontein No. 1725, is preferred due to its suitable climatic conditions, topography (i.e. in terms of gradient), environmental conditions (i.e. agricultural potential, ecological sensitivity), proximity to a feasible grid connection point (i.e. for the purpose of electricity evacuation), as well as site access (i.e. to facilitate the movement of machinery, equipment, infrastructure and people during the construction phase).

The site falls within an area used for grazing, and avoids any high agricultural areas, such as areas under pivot irrigation. The site is considered to have limited environmental sensitivity as a result.

Within the affected property a site of ~72ha has been identified by the Applicant for the development within which the smaller development footprint of 40ha will be placed. The full extent of the site is under assessment as part of this Basic Assessment process. The extent of the site, i.e. it being much larger than the planned development footprint, therefore offers

the Applicant with an opportunity to place the Castor Solar PV Project within areas deemed suitable from a technical and environmental perspective.

No alternative areas for the site within the affected property have been considered for the placement of infrastructure/development footprint based on feedback from the landowner and the current land use areas, as well as the opportunities that the site location presents for the limited grid connection infrastructure required in order to evacuate the generated electricity into the national grid, and direct access to the site from the R64 regional road. Therefore, there is a single preferred location alternative / site proposed that will be assessed – refer to Figure 5.1 below.

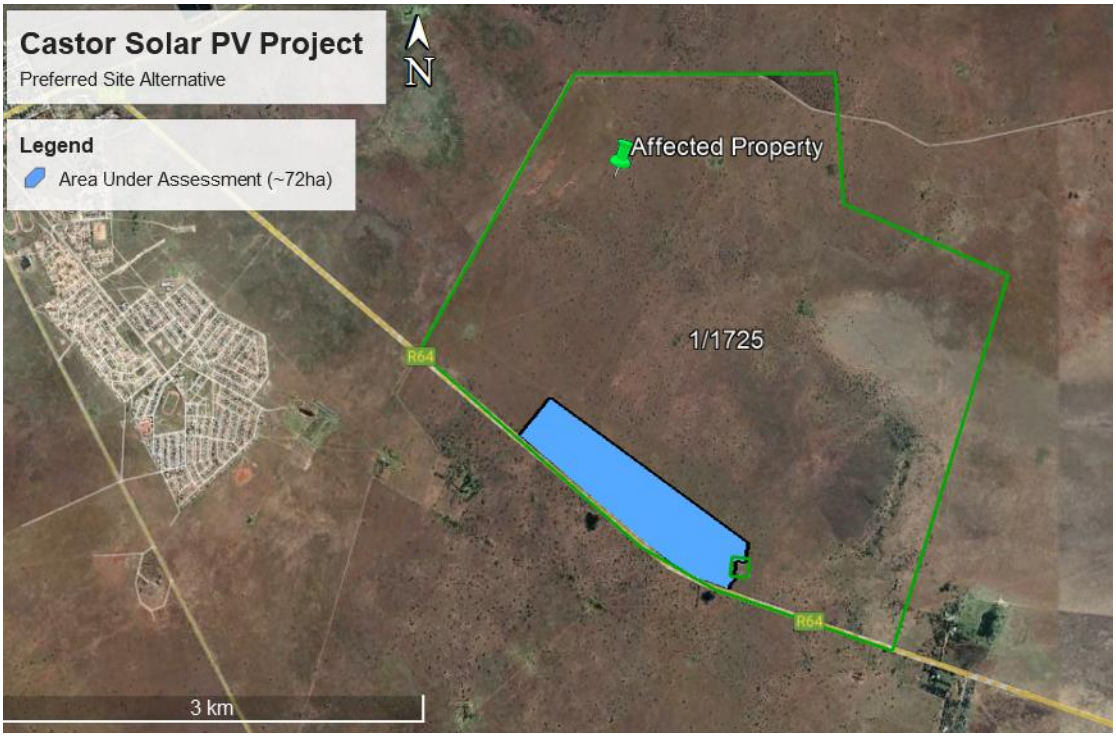


Figure 5.1: Location of the preferred site alternative within the affected property for the Castor Solar PV Project development footprint

5.1.3 Activity Alternatives

The BA process also needs to consider if the development of the Castor Solar PV Project would be the most appropriate land use for the particular site.

- **Photovoltaic (PV) solar facility** – Castor Solar PV Project (Pty) Ltd is part of a portfolio of solar PV projects throughout South Africa. Castor Solar PV Project (Pty) Ltd is of the opinion that solar PV technology is perfectly suited to the site, given the high irradiation values for the Boashof area – refer to Figure 5.2. The technology furthermore entails low visual impacts, have relatively low water requirements, is a simple and reliable type of technology and all the components can be recycled.

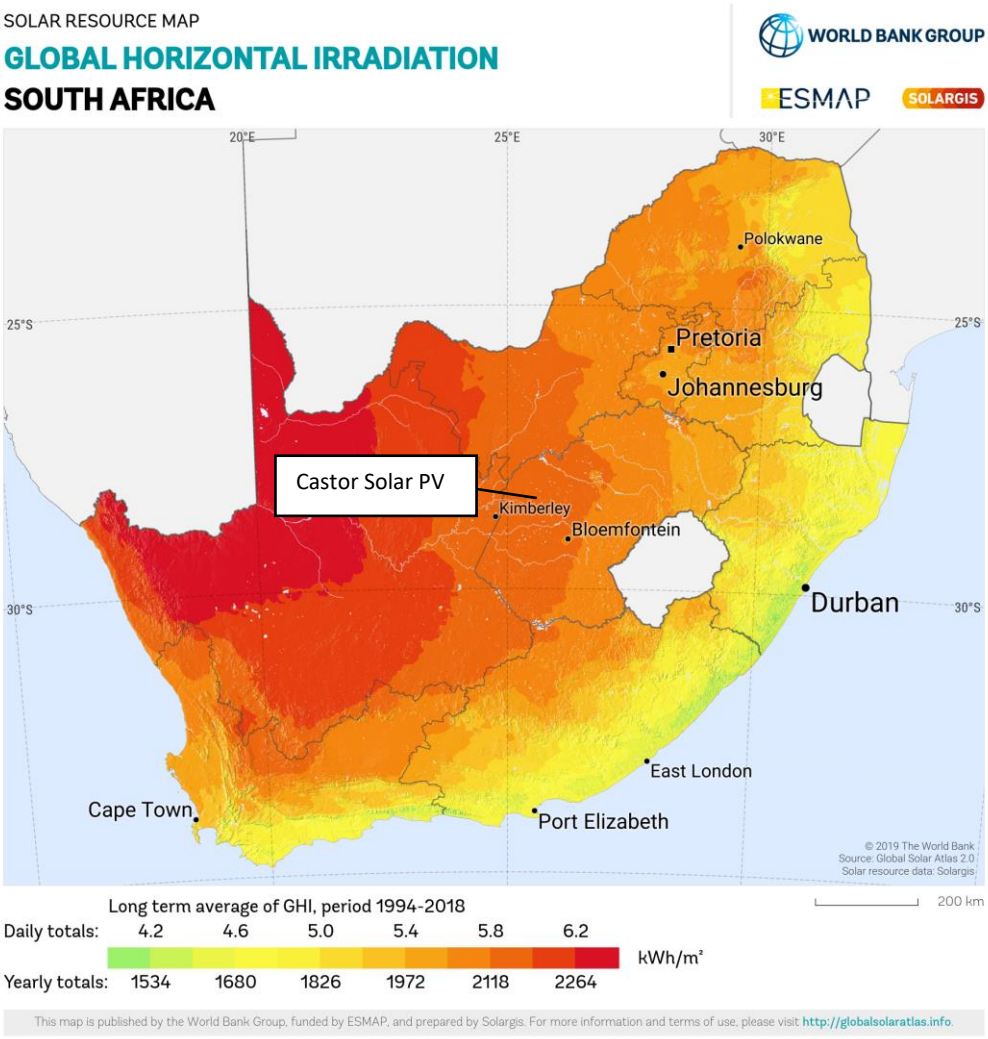


Figure 5.2: Global horizontal irradiation values for South Africa (SolarGIS, 2021) and the location of the Castor Solar PV Project

- **Wind energy facility** - Due to the local climatic conditions a wind energy facility is not considered suitable as the area does not have the required wind resource. Furthermore, the applicant has opted for the generation of electricity via solar power rather than the use of wind turbines. This alternative is therefore regarded as not feasible and will not be evaluated further in this report.
- **Concentrated solar power (CSP) technology** - CSP technology requires large volumes of water and this is a major constraint for this type of technology. While the irradiation values are high enough to generate sufficient solar power, the water constraints render this alternative not feasible. Therefore, this alternative will not be considered further in this report.

5.1.4 Technical alternatives

Possible technical alternatives for the development of a solar PV facility needs to be considered during the BA process.

5.1.4.1 Distribution lines

Connecting the PV plant to the electrical grid requires transformation of voltage to 22kV or 66kV. Specific power line infrastructure will be required.

An onsite substation and switching stations will be required on the site to step the voltage up to 22kV or 66kV, after which the power will be evacuated into the national grid via a new proposed power line. It is expected that generation from the facility will tie in with the existing Bosplaat Rural Substation located within the affected property.

The power line routes (five options for the alignment) will be assessed within a grid connection corridor of between 50 and 200m wide, which will connect the project to the existing Eskom substation compound. All five route options fall within the grid connection corridor proposed and assessed and all five are considered to be technically feasible. This will provide flexibility for the development from a technical perspective. Refer to Figure 5.3.

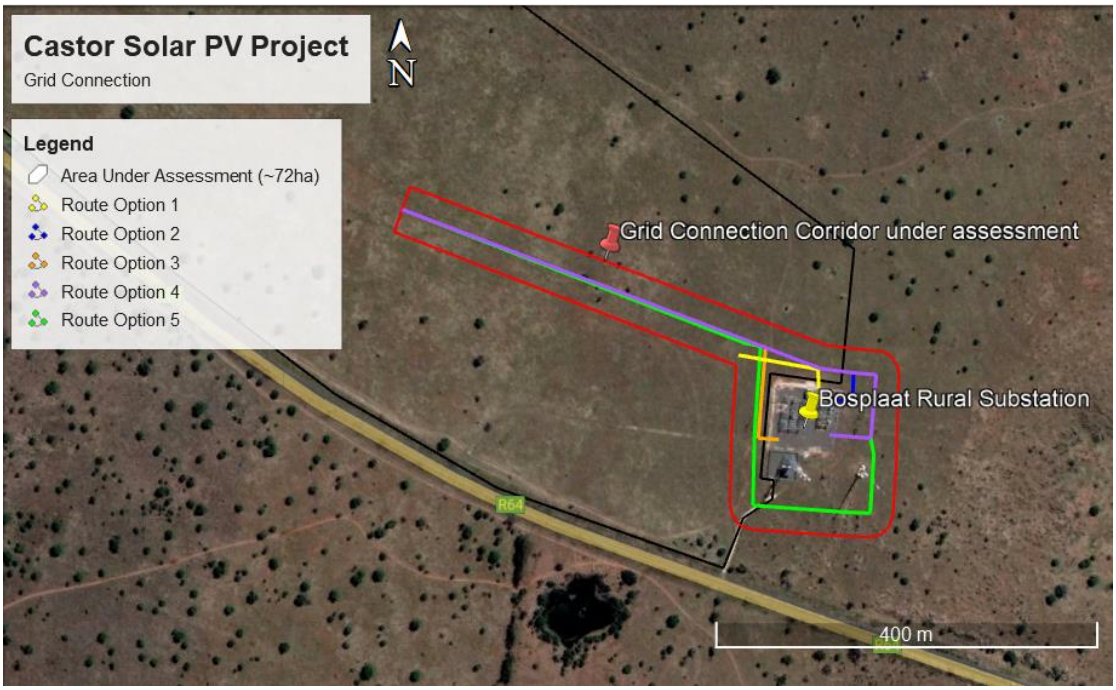


Figure 5.3: The grid connection corridor proposed for approval which includes the five route options in order to connect the Castor Solar PV Project to the Bosplaat Rural Substation

Following the assessment of the site and grid connection corridor by the specialists the ecologist identified an area to the south of the Bosplaat Rural Substation which is categorised as Rocky Thornveld Habitat, and of a high ecological sensitivity.

Based on the above, the Applicant has discarded Route Option 5 within the grid connection corridor to ensure that infringement into the sensitive habitat is completely avoided. Therefore, only 4 route options within the assessed grid connection corridor are being proposed for development. It is however requested that the entire grid connection corridor be authorised as to provide technical flexibility for the grid connection solution. Refer to Figure 5.4.

Figure 5.4: Final grid connection routes proposed for the Castor Solar PV Project within the assessed grid connection corridor

A 22/66kV overhead distribution line is the only preferred alternative for the applicant due to the following reasons:

- **<u>Overhead Distribution Lines</u>** - Overhead lines are less costly to construct than underground lines. Therefore, the preference for the development of overhead lines is mainly based on the grounds of cost. Overhead lines allow high voltage operations, and the surrounding air provides the necessary electrical insulation to earth. Further, the surrounding air cools the conductors that produce heat due to lost energy (Swingler et al, 2006).

  The overall weather conditions in the Free State Province are unlikely to cause damage and faults on the proposed overhead power line. Nonetheless, if a fault occurs, it can be found quickly by visual means using a manual line patrol. Repair to overhead lines is relatively simple in most cases the line can usually be put back into service within a few days. In terms of potential impacts caused by overhead power lines include visual intrusion and threats to sensitive habitat (where applicable).

  Furthermore, overhead power lines also provide an opportunity for the avoidance of sensitive environmental features as the overhead lines can span on-ground environmental features to ensure conservation, therefore providing more flexibility in terms of mitigation of the associated on-ground disturbance.

  The choice of structure to be used for the power line will be determined in consultation with Eskom once the Engineers have assessed the geotechnical and topographical conditions and decided on a suitable structure which meets the prescribed technical requirements. The choice of structures to be used will not have any adverse impacts on the environment. The line will be constructed according to the authorised standards for a power line approved by Eskom Holdings SoC Ltd.

  The following alternatives may be considered for the overhead power line:

- Single Circuit Overhead Power Line

  The use of single circuit overhead power lines to distribute electricity is considered the most appropriate technology and has been designed over many years for the existing environmental conditions and terrain as specified in the Eskom Specifications and best international practice. Based on all current technologies available, single circuit overhead power lines are considered the most environmentally practicable technology available for the distribution of power. This option is considered appropriate for the following reasons:

  - More cost-effective installation costs;
  - Less environmental damage during installation; and
  - More effective and cheaper maintenance costs over the lifetime of the power line.

- Double Circuit Overhead Power Line

  Where sensitive environmental features are identified, and there is sufficient justification, Eskom will consider the use of double circuit (placing 2 power lines on either side of the same tower structure) to minimise impacts. However, the use of double-circuiting has a number of technical disadvantages, which includes faults or problems on one power line may mean that the other power line is also disabled during maintenance, and this will affect the quality of supply to an area. Larger and taller towers as well as more towers are required for double-circuit power lines.

  The double-circuit overhead power line proves more feasible since the single circuit may not have the capacity to transmit the large amount of electricity generated from the plant and during maintenance the entire plant would not have to be offline as one of the double circuit lines would still be able to supply electricity. However, due to the rapid requirement changes, this will only be determined before construction.

- **Underground Distribution Lines** - Underground cables have generally been used where it is impossible to use overhead lines for example because of space constraints. Underground cables are oil cooled and are also at risk of groundwater contamination. Maintenance is also difficult on underground lines compared to overhead lines. When a fault occurs in an underground cable circuit, it is almost exclusively a permanent fault due to poor visibility. Underground lines are also more expensive to construct than overhead lines.

5.1.5 Design and layout alternatives

Design alternatives were considered throughout the planning and design phase (i.e. what would be the best design option for the development?). In this regard discussions on the design were held between the EAP and the developer, taking special note of the requirements stipulated by the independent specialists. The layout plan is included in Appendix G and Figures H and I.

The layout follows the limitations of the site and aspects such as environmental sensitive areas (supported by specialist input), roads, areas not deemed available for development by the landowner, fencing and servitudes are considered. The total surface area proposed for layout

options include the PV panel arrays spaced to avoid shadowing, access and maintenance roads and associated infrastructure (buildings, power inverters, power lines and substations and perimeter fences). With regards to the structure orientation, Bi-facial panels with single axis tracking are preferred over fixed-axis or double axis tracking systems, and mono-facial panels due to the potential to achieve higher annual energy yields whilst minimising the balance of system (BOS) costs, resulting in the lowest level cost of energy (LCOE).

The choice of pylon structure to be used for the power line will be determined in consultation with Eskom. The choice of pylon structure does not significantly affect the environmental impacts of the proposed development as provision has already been made for the visual, ecological and avifaunal impacts of erecting a power line. No defined structure has been confirmed at this stage and will depend on Eskom's technical requirements. The new power line must be constructed according to the authorised standards for a power line approved by Eskom Holdings SoC Ltd. The structure to be utilised for the power line towers will also be informed by the local geotechnical and topographical conditions. The following alternatives are considered with regards to the proposed structures:

Steel lattice towers:

The steel lattice towers provide the following advantages over the other tower types available:

- Enables multipath earthing which enhances the overall electrical performance of the power line.
- Is visually less obtrusive than the mono-pole options.
- Is more practicable that other options i.e., more cost effective and more practical to construct and maintain.
- Is safer to work on than the monopole and wood pole structures.
- Is more durable than the wood pole structures.

Steel monopoles:

The steel monopole is considered less suitable than the steel lattice towers for the following reasons:

- Is visually more intrusive than the lattice towers.
- Is more expensive than the lattice towers.
- Requires more steel than the lattice towers.
- Is more difficult to erect.
- Is not as safe to work on as the lattice towers.

Wood poles:

Wood pole structures are only used in extreme circumstances where a visual impact needs to be avoided. Wood pole structures may be cheaper to produce and to construct, but they have one tenth of the lifespan of the metal counterparts and are far more susceptible to weather conditions which makes them less efficient and practicable. The wood pole structure is also

more susceptible to having the cross arms burnt off by electrical faults as well as being susceptible to deformation with height.

5.1.6 Technology alternatives

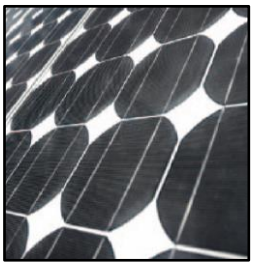
Technology alternatives for the development of a solar PV facility needs to be considered during the BA process.

5.1.6.1 Photovoltaic solar panels

There are several types of semiconductor technologies currently available and in use for PV solar panels. Two, however, have become the most widely adopted, namely crystalline silicon, thin film or bifacial PV panels. These technologies are discussed in more detail below:

- **Crystalline (high efficiency technology at higher cost)**

  Crystalline silicon panels are constructed by first putting a single slice of silicon through a series of processing steps, creating one solar cell. These cells are then assembled together in multiples to make a solar panel. Crystalline silicon, also called wafer silicon, is the oldest and the most widely used material in commercial solar panels. Crystalline silicon modules represent 85-90% of the global annual market today. There are two main types of crystalline silicon panels that can be considered for the solar facility:



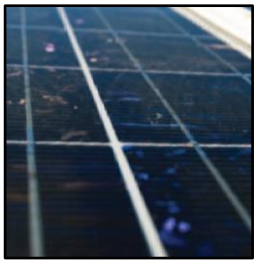
- ***Mono-crystalline Silicon*** - mono-crystalline (also called single crystal) panels use solar cells that are cut from a piece of silicon grown from a single, uniform crystal. Mono-crystalline panels are among the most efficient yet most expensive on the market. They require the highest purity silicon and have the most involved manufacturing process.

- ***Poly-crystalline Silicon*** – poly-crystalline panels use solar cells that are cut from multifaceted silicon crystals. They are less uniform in appearance than mono-crystalline cells, resembling pieces of shattered glass. These are the most common solar panels on the market, being less expensive than mono-crystalline silicon. They are also less efficient, though the performance gap has begun to close in recent years (First Solar, 2011).

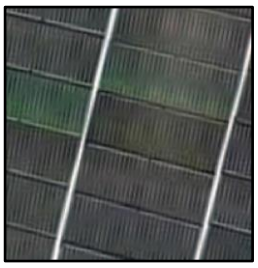
- **Thin film (low-cost technology with lower efficiency)**

  Thin film solar panels are made by placing thin layers of semiconductor material onto various surfaces, usually on glass. The term *thin film* refers to the amount of semiconductor material used. It is applied in a thin film to a surface structure, such as a sheet of glass. Contrary to popular belief, most thin film panels are not flexible. Overall, thin film solar panels offer the lowest manufacturing costs, and are becoming more prevalent in the industry. Thin films currently account for 10-15% of global PV module sales. There are three main types of thin film used:

- ***Cadmium Telluride (CdTe)*** - CdTe is a semiconductor compound formed from cadmium and tellurium. CdTe solar panels are manufactured on glass. They are the most common type of thin film solar panel on the market and the most cost-effective to manufacture. CdTe panels perform significantly better in high temperatures and in low-light conditions.



- ***Amorphous Silicon*** - Amorphous silicon is the non-crystalline form of silicon and was the first thin film material to yield a commercial product, first used in consumer items such as calculators. It can be deposited in thin layers onto a variety of surfaces and offers lower costs than traditional crystalline silicon, though it is less efficient at converting sunlight into electricity.



- ***Copper, Indium, Gallium, Selenide (CIGS)*** - CIGS is a compound semiconductor that can be deposited onto many different materials. CIGS has only recently become available for small commercial applications and is considered a developing PV technology (First Solar, 2011).

- **Bifacial panels:**

  As the name suggests, bifacial solar panels have two faces, or rather, they can absorb light from both sides of the panel. A lot of potential energy transfer is lost in traditional solar cells when the light hits the back of a solar panel. Most bifacial solar panels use monocrystalline cells, whereas traditional cells use polycrystalline materials. The monocrystalline materials, alongside the clear light pathway on both sides of the panel, enable the light to be absorbed from either side of the cell, and it is thought that, that the overall efficiency of these cells can be up to 30% greater in commercial applications. Although, the exact amount is variable depending on the surface that they are installed on. The front side of the solar panel still absorbs most of the solar light, but the back side of the solar panel can absorb between 5-90% of the light absorbed by the front of the solar panel.

  Traditional solar panels use an opaque back sheet. By comparison, bifacial solar panels either have a clear/reflective back sheet or have dual panes of glass. Most of these solar panels are frameless so any issues with potential-induced degradation (PID) are reduced. To efficiently convert light into electricity from both sides, bifacial solar cells have selective-area metallization schemes that enable light to pass between the metallized areas, rather than the conventional thick metal collectors as seen with monofacial solar panels.

Due to the rapid technological advances being made in the field of solar technology the exact type of technology to be used, such as bifacial panels, will only be confirmed at the onset of the project.

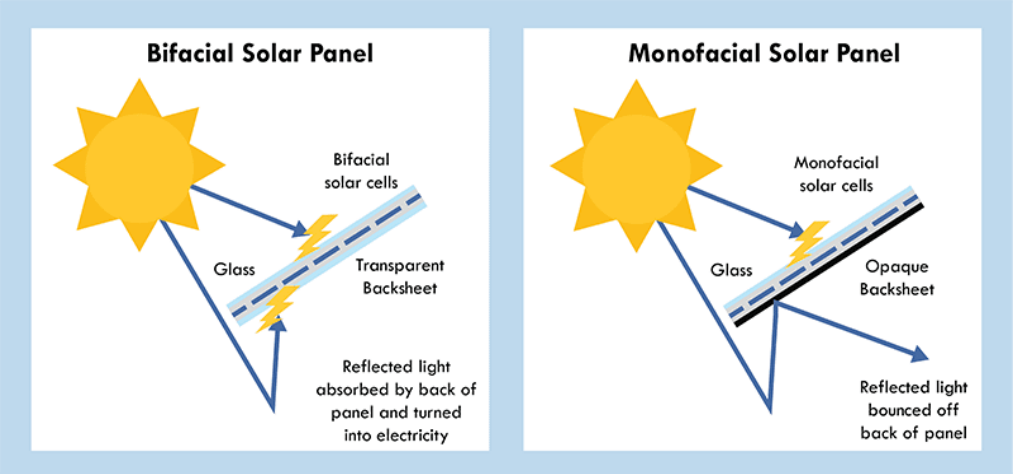


Figure 5.5: Bifacial vs Monofacial Solar Panel absorption

5.2 PUBLIC PARTICIPATION PROCESS

The following sections provide detailed information on the public participation process conducted in terms of Regulations 39 to 44.

5.2.1 General

The public participation process was conducted strictly in accordance with Regulations 39 to 44. The following three categories of variables were taken into account when deciding the required level of public participation:

- The scale of anticipated impacts
- The sensitivity of the affected environment and the degree of controversy of the project
- The characteristics of the potentially affected parties

Since the scale of anticipated impacts is low, the low environmental sensitivity of the site (i.e. used for grazing and game farming) and the fact that no conflict was foreseen between potentially affected parties, no additional public participation mechanisms were considered at this stage of the process. The following actions have already been taken:

- Newspaper advertisement

  Since the proposed development is unlikely to result in any impacts that extend beyond the municipal area where it is located, it was deemed sufficient to advertise in a local newspaper. An advertisement was placed in English in the local newspaper (Noordkaap Bulletin) on the 30 June 2022 (see Appendix C1) notifying the public of the BA process and requesting Interested and Affected Parties (I&APs) to register with, and submit their comments to Environamics Environmental Consultants. I&APs

were given the opportunity to raise comments within 30-days from the placement of the advertisement.

- Site notices

  Site notices were placed on site in English and Afrikaans on 27 May 2022 to inform surrounding communities and immediately adjacent landowners of the proposed development. I&APs were given the opportunity to raise comments within 30-days. Photographic evidence of the site notices is included in Appendix C2.

- Direct notification of identified I&APs

  Identified and registered I&APs, including key stakeholders representing various sectors, were directly informed of the Basic Assessment process via telephone calls, WhatsApps and emails (as appropriate). See Appendix C3 to this report. A Background Information Document was also distributed to the registered I&APs

- Direct notification of surrounding landowners and occupiers

  Written notices were provided via WhatsApp, sms or email to all surrounding landowners and occupiers – refer to Figure 5.6. The surrounding landowners were given the opportunity to raise comments within 30 days. For a list of surrounding landowners see Appendix C3.

- Circulation of Draft Basic Assessment Report

  The registered I&APs were notified of the availability of the draft BAR at the commencement of the 30-day review and comment period. This included the details of where the report can be accessed. They were requested to provide their comments on the report within 30 days (30 August 2022 – 30 September 2022). All issues that are identified, raised and recorded will be documented and compiled into a Comments and Responses Report (Appendix C6) and included as part of the Final Basic Assessment Report.

- Circulation of decision and submission of appeals:

  Notice will be given to all identified and registered I&APs of the decision taken by the DFFE. The attention of all registered I&APs will also be drawn to the fact that an appeal may be lodged against the decision in terms of the National Appeals Regulations. In accordance with the provisions of Regulation 4(1) of Government Notice No. 993, an appellant must submit the appeal to the appeal administrator, and a copy of the appeal to the applicant, any registered I&APs and any organ of state with interest in the matter within 20 days from the date that the notification of the decision was sent to the applicant by the competent authority.

Figure 5.6: Surrounding Landowners

5.2.2 Consultation process

Regulation 41 requires that the landowner, surrounding landowners, municipality, relevant ward councillor, any organ of state having jurisdiction in respect of any aspect of the activity and any other party as required by the competent authority should be given written notice of the activity. A complete list of all the consultees who received written notice as well as proof of correspondence is attached as Appendices C.

5.2.3 Registered I&APs

I&APs include all stakeholders who deem themselves affected by the proposed activity. According to Regulation 43(1) "*A registered interested and affected party is entitled to comment, in writing, on all reports or plans submitted to such party during the public participation process contemplated in these Regulations and to bring to the attention of the proponent or applicant any issues which that party believes may be of significance to the consideration of the application, provided that the interested and affected party discloses any direct business, financial, personal or other interest which that party may have in the approval or refusal of the application*."

This report is the Draft Basic Assessment Report which has been made available to all potential and/or registered I&APs and State Departments. They have been provided with a copy of the Draft BAR and have been requested to provide written comments on the report within 30 days. All issues identified during this review period will be documented and compiled into a Comments and Response Report to be included as part of the Final BAR (Appendix C6).

All comments received prior to the release of the Draft BAR for the 30-day review and comment period have been included in this report as Appendix C5 and Appendix C6 to provide I&APs an opportunity to confirm that their comments raised during the initial public participation phase have been included and considered.

5.2.4 Issues raised by I&APs and consultation bodies

To date comments have been received from some consultation bodies, including the interim comment from the South African Heritage Resources Agency, and is summarised in the Comments and Response Report included in Appendix C6. Any comments received during the circulation of the Draft BAR will be summarised in the Final BAR. The full wording and original correspondence are included in Appendix C5 and Appendix C6.

5.3 THE ENVIRONMENTAL ATTRIBUTES ASSOCIATED WITH THE PREFERRED ALTERNATIVE

The following sections provide general information on the biophysical and socio-economic attributes associated with the preferred location / site alternative.

5.3.1 Biophysical environment

The biophysical environment is described with specific reference to geology, soils, agricultural potential, vegetation and landscape features (including wetlands), climate, biodiversity, heritage features (in terms of archaeology and palaeontology), the visual landscape and the social environment to be affected. A number of specialists were consulted to assist with the compilation of this chapter of the report – refer to the Table 1.2.

However, due to the fact that the area proposed for development (i.e. the development footprint) exclusively consists of land used for grazing and excludes the areas under pivot irrigation, limited sensitive areas from ab ecological or conservation point have been identified. These include the close proximity of the project to the Vaal River, wetland zones / fauna corridors associated with grid connection option 1 and areas of medium-high sensitivity which includes grasslands with perched water table conditions and sensitive fauna habitat.

5.3.1.1 Geology, soils and agricultural potential

According to the desktop Palaeontological Impact Assessment undertaken for the previously authorised solar energy facility (Appendix D6) the western extent of the affected property is underlain by dolerite intrusions of Early Jurassic age assigned to the Karoo Dolerite Suite. These igneous rocks are entirely unfossiliferous. The eastern portion is underlain by basinal mudrocks of the Tierberg Formation (Ecca Group) of Permian age.

The Tierberg Formation (Ecca Group, Karoo Supergroup) is a recessive-weathering, mudrock-dominated succession consisting predominantly of dark, well-laminated, carbonaceous shales with subordinate thin, fine-grained sandstones. The Tierberg shales are Early to Middle Permian in age and were deposited in a range of offshore, quiet water environments below wave base. These include basin plain, distal turbidite fan and distal prodelta settings in ascending order. Thin coarsening-upwards cycles occur towards the top of the formation with local evidence of soft-sediment deformation, ripples and common calcareous concretions (often with well- developed cone-in-cone structures). A restricted, brackish water environment is reconstructed for the Ecca Basin at this time. Close to the contact with Karoo dolerite intrusions the Tierberg mudrocks are baked to a dark grey hornfels with a reddish-brown crust or patina.

Small but mappable exposures of calcrete or surface limestone occur overlying sediments of the Ecca Group as well as the Karoo Dolerite Suite intrusions, the probable source of much of the carbonate are probably associated with pan sediments overlying the Tierberg outcrop. These pedogenic limestone deposits replace or displace the near-surface bedrocks to a depth of several meters. They reflect seasonally arid climates in the region over the last five or so million years and are briefly described for the Kimberley sheet area. Although calcrete is still forming in the site today, it forms subsurface and when exposed at the surface is “almost definitely fossil”. Calcrete types commonly encountered include glaebular calcrete (with discrete nodules), honeycomb calcrete (with coalescent glaebules) and hardpan calcrete (solid

limestone within at most minor voids). The surface limestones may reach thicknesses of over 10m, but are often much thinner, and are locally conglomeratic with clasts of reworked calcrete as well as exotic pebbles.

According to the Agricultural Compliance Statement (Appendix D4) the site falls within the Ae 45 land type. The Ae 45 land type is mostly predominated by Hutton, Mispah, Swartland and Sterkspruit soil forms with also the occurrence of bare rocks and other soils occurring throughout the terrains, following the South African soil classification working group. The Ae land types are characterised with shallow profiles and occurrence of rocky areas. Furthermore, they are characterised with red to yellow-brown apedal and freely drained soils. The soils have a high base status with profiles deeper than 300 mm without any occurrence of dunes.

The most sensitive soil forms identified within the site are the Hutton, Nkonkoni and Kimberley soil forms, with other associated soils also occurring. The Hutton soil form consists of an orthic topsoil horizon on top of a thick red apedal subsurface diagnostic horizon. The Nkonkoni soil form consist of an orthic topsoil on top of a red apedal horizon that overlays a lithic subsoil horizon. Lastly, the Kimberley soil form consists of an orthic topsoil on top of a red apedal that overlays a soft carbonate subsoil horizon.

The land capability of the above-mentioned soils has been determined to have land capability classes of “IV” and “VI” with a climate capability level 8 given the low Mean Annual Precipitation (MAP) and the high Mean Annual Potential Evapotranspiration (MAPE) rates. The combination between the determined land capabilities and climate capabilities results in land potentials “L6” and “L7”. The “L6” land potential level is characterised by a very restricted potential. Regular and/or severe limitations that occur due to soil, slope, temperatures or rainfall. The “L7” land potential level is characterised by a low potential. Severe limitations due to soil, temperatures or rainfall. These areas are non-arable. The “L6” and “L7” land potential are characterized with a “Low to Moderate sensitivity”.

The site is associated with non-arable lands. The available climate limits crop production significantly. The harsh climatic conditions are associated with low annual rainfall and high evapotranspiration potential demands of the area, which consequently result in a very restricted choice of crops due to the heat and moisture stress. The area is not favourable for most cropping practices, which corresponds to the current livestock and game farming activities in the area, and the affected property.

5.3.1.2 Vegetation, topography and habitat types

The slope percentage of the site has been calculated. Most of the area is characterised by a slope percentage between 0 to 4% with some irregularities in areas with slopes reaching 8%. A non-uniform topography with occurrence of some steep sloping areas are present. The Digital Elevation Model (DEM) of the site indicates an elevation of 1 263 to 1 283 Metres Above Sea Level (MASL).

The site is situated within the savanna biome. The savanna vegetation of South Africa represents the southernmost extension of the most widespread biome in Africa. Major macroclimatic traits that characterise the Savanna biome include seasonal precipitation and a (sub) tropical thermal regime with no or usually low incidence of frost.

The savanna biome is the largest biome in South Africa, extending throughout the eastern and north-eastern areas of the country. Savannas are characterised by dominant grass layers, over-topped by a discontinuous, but distinct woody plant layer. At a structural level, Africa's savannas can be broadly categorised as either fine-leaved (microphyllous) savannas or broad-leaved savannas. Fine-leaved savannas typically occur on nutrient rich soils and are dominated by microphyllous woody plants of the Mimosaceae family (Common genera include *Vachellia & Albizia*) and a generally dense herbaceous layer.

The savanna biome is comprised of 6 parent bioregions and a total of 87 different vegetation types. The site is situated within Kimberley Thornveld of the Eastern Kalahari Bushveld Bioregion, existing adjacent to the grassland biome.

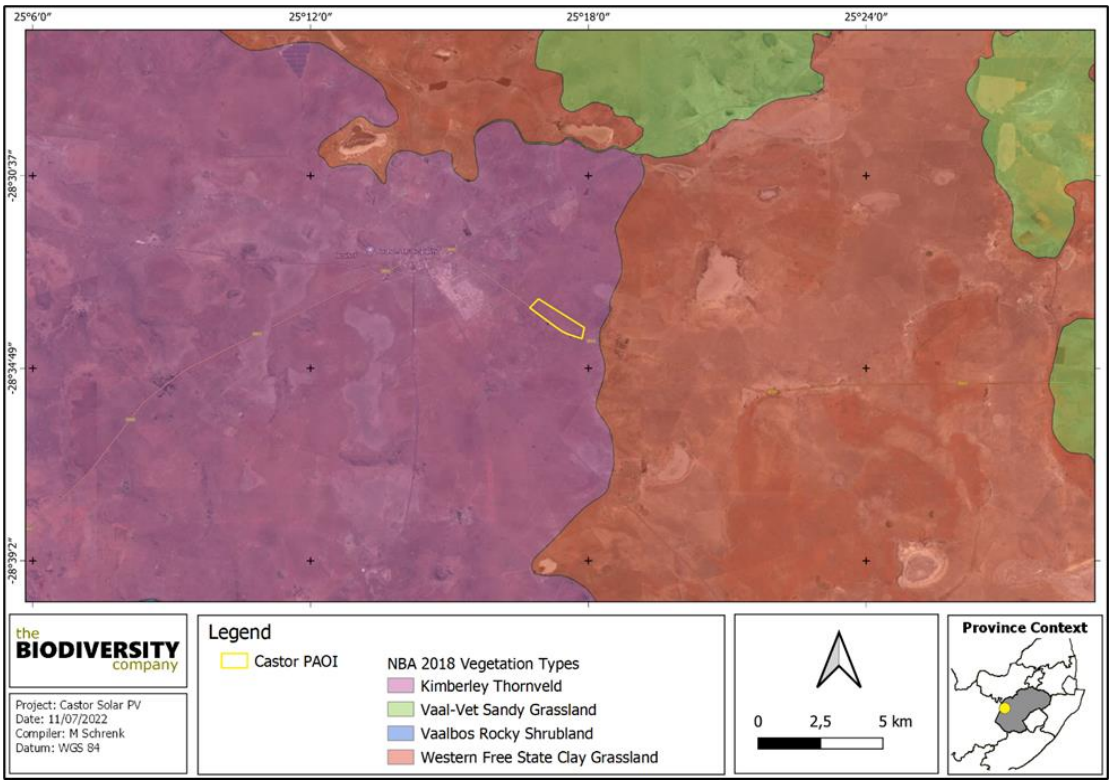


Figure 5.7: The Castor Solar PV Project site is located within the Kimberley Thornveld vegetation type

Kimberly Thornveld extends throughout most of the Kimberley, Hartswater, Bloemhof and Hoopstad Districts and is characterised by plains that are often slightly irregular with a well-developed tree and shrub layer with occasional dense stands of *Tarchonanthus camphoratus* and *Senegalia mellifer*a. The grass layer is open with much uncovered soil.

This vegetation type is classified as 'Least Threatened', with the national target for conservation protection for Kimberly Thornveld being 16%. Only 2% is statutorily conserved in the Vaalbos National Park as well as in Sandveld, Bloemhof Dam and S.A. Lombard Nature Reserves. Some 18% has been transformed, mostly by cultivation. The area is mostly used for cattle farming or game ranching, and it is noted that overgrazing leads to the encroachment of *Senegalia mellifera subsp. detinens*.

The following species are considered important in the Kimberly Thornveld vegetation type (d = dominant):

- Tall Tree: *Vachellia erioloba* (d).
- Small Trees: *Vachellia karroo* (d), *S. mellifera subsp. detinens* (d), *V. tortilis subsp. heteracantha* (d), *Searsia lancea*.
- Tall Shrubs: *Tarchonanthus camphoratus* (d), *Diospyros pallens*, *Ehretia rigida subsp. rigida*, *Euclea crispa subsp. ovata*, *Grewia flava*, *Lycium arenicola*, *L. hirsutum*, *Rhus tridactyla*.
- Low Shrubs: *Acacia hebeclada subsp. hebeclada* (d), *Anthospermum rigidum subsp. pumilum, Helichrysum zeyheri, Hermannia comosa*, *Lycium pilifolium*, *Melolobium microphyllum*, *Pavonia burchellii, Peliostomum leucorrhizum, Plinthus sericeus, Wahlenbergia nodosa*.
- Succulent Shrubs: *Aloe hereroensis var. hereroensis, Lycium cinereum*.
- Graminoids: Eragrostis lehmanniana (d), *Aristida canescens, A. congesta, A. mollissima subsp. argentea, Cymbopogon pospischilii, Digitaria argyrograpta, D. eriantha subsp. eriantha, Enneapogon cenchroides, E. scoparius, Eragrostis rigidior, Heteropogon contortus, Themeda triandra*.
- Herbs: *Barleria macrostegia, Dicoma schinzii, Harpagophytum procumbens subsp. procumbens, Helichrysum cerastioides, Hermbstaedtia odorata, Hibiscus marlothianus, Jamesbrittenia aurantiaca, Lippia scaberrima, Osteospermum muricatum, Vahlia capensis subsp. vulgaris*.
- Succulent Herbs: *Aloe grandidentata, Piaranthus decipiens*.

Further to the vegetation type present within the site, specific habitat types have been identified (Appendix D1). The main habitat types identified across the site were initially delineated largely based on aerial imagery, and these main habitat types were then refined based on the field coverage and data collected during the specialist survey. Three habitats were delineated in total, and these are mapped in Figure 5.8 below. The locations of two individuals of the protected plant, *Brunsvigia radulosa*, are also included in the map.

One of the habitats observed closely coincides with the historical vegetation type as described by Mucina & Rutherford (2006) – that being Grassy Thornveld, the most prominent vegetation type within the site.

Figure 5.8: Habitat types present within the Castor Solar PV Project site

Table 5.1: Summary of the habitat types present at the Castor Solar PV Project site

Habitat type	Description	Dominant flora	Photograph
Grassy Thornveld	● Mostly functional savannah habitat supporting a diversity of indigenous fauna and flora. ● Most widespread habitat that occurs across the site. ● Closely represents the historic regional vegetation and is dominated by a diversity of pioneer and climax graminoid species as well as several trees and shrubs. ● Impacted state as a result of the edge effects of power and road infrastructure development, only minor rehabilitation would be required to return the area to its most functional state. ● Although impacted, it maintains a functional state and supports a diversity of fauna species, through the provision of both foraging and nesting resources. At least several fauna Species of Conservation Concern (SCC) are confirmed to frequent these areas and it is noted that certain threatened bird species may use the large trees and/or power infrastructure for nesting. ● Habitat sensitivity: Medium	● *Themeda triandra, Aristida congesta* and *Eragrostis lehmanniana* grasses with a strong population of *Vachellia tortilis subsp. heteracantha* trees.	

Rocky Thornveld	• Rocky areas within the savannah vegetation representing an important micro-habitat for unique flora and fauna. • A small portion of land in the south east corner of the site contains a dense collection of rocky material which serves as a unique microhabitat feature that is likely to be supportive of reptile and small mammal species native to the area. • Likely to be supportive of habitat specialist flora that may not be observable in the drier seasons, such as geophytes and micro succulents. • Habitat sensitivity: High	• *Laggera decurrens* herbs and *Searsia lancea* and *Tarchonanthus camphoratus* shrubs.	
Transformed	• Largely non-function areas with minimal to no indigenous vegetation remaining. • The transformed habitat unit represents all areas of the site that no longer support functional vegetation, such as commonly used roads and extensive power line networks (and the associated on-site substation infrastructure). • Holds some importance due to the fact that the local fauna (including SCC) will frequently cross the road and power line networks and certain bird species may use parts of the electrical infrastructure as nesting sites. • Habitat sensitivity: Low	• Few pioneer grasses such as *Aristida congesta*.	

Protected Areas, Critical Biodiversity Areas (CBA) and Ecological Support Areas (ESA)

The site occurs within 1 km of the 9100 ha Boshof Nature Reserve. It is important to consider that numerous fauna species that utilise/depend on the reserve area are likely to move through, forage and or nest nearby or within the site. Refer to Figure 5.9.

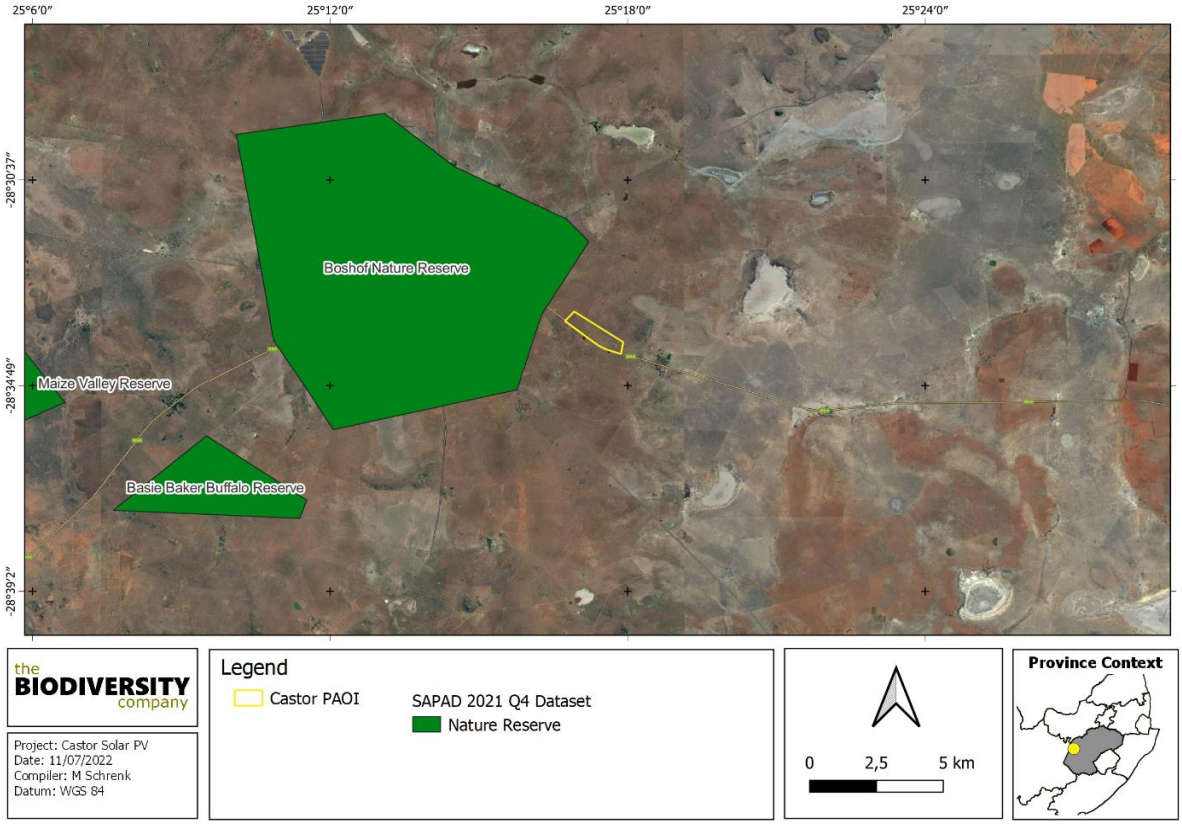


Figure 5.9: Castor Solar PV Project in relation to the Boshof Nature Reserve, as listed in South African Protected Areas Database.

According to the 2015 Free State CBA and ESA (Critical Biodiversity Area and Ecological Support Area) map dataset the site overlaps mostly with ESA1 area. These areas are defined as sites with minimal degradation which play an important role in supporting the ecological functioning of a protected area or Critical Biodiversity Area, or in delivering ecosystem services. In most cases ESAs are currently in at least a fair ecological condition and should remain in at least a fair functioning condition. Refer to Figure 5.10.

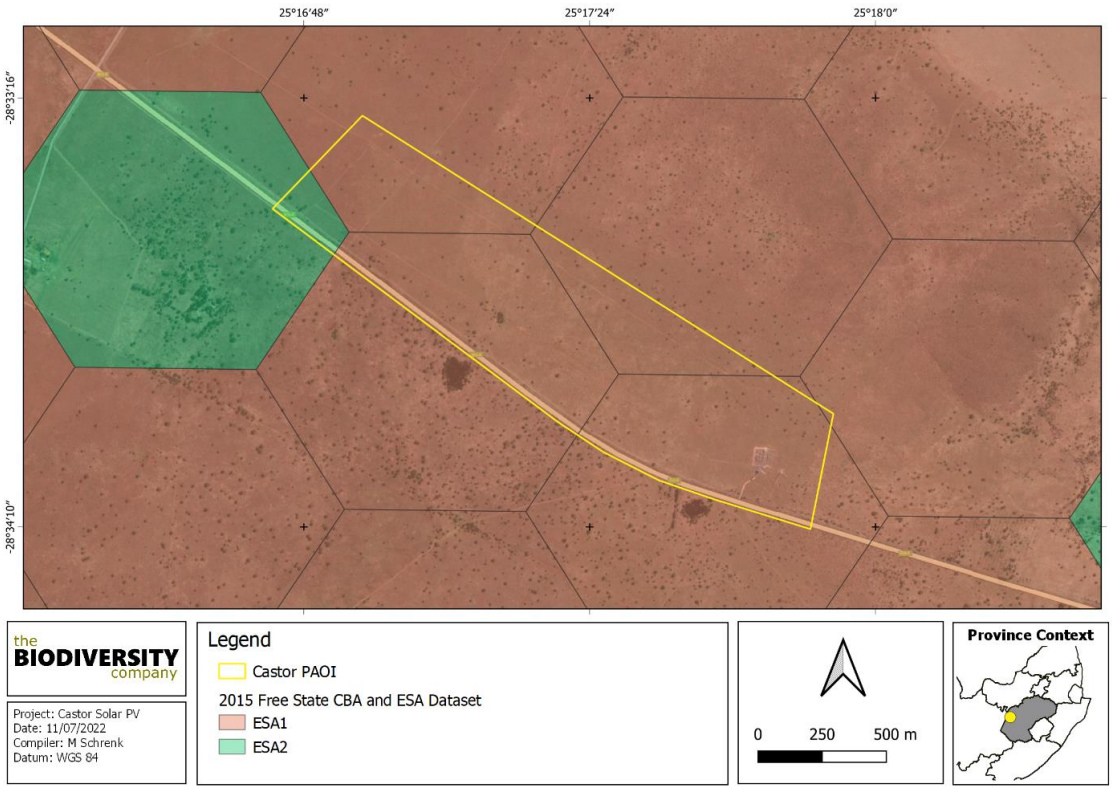


Figure 5.10: Critical Biodiversity Map for the Castor Solar PV Project

The site does not overlap any National Protected Areas Expansion Strategy Focus Area (NPAES), but it is located approximately 600 m west of the Free State Highveld Grasslands Focus Area at its closest point (Figure 5.11). This focus area includes some of the last remaining opportunities for relatively large, protected areas in the highly threatened Grassland Biome, as well as the opportunity to incorporate intact river reaches and several threatened river systems.

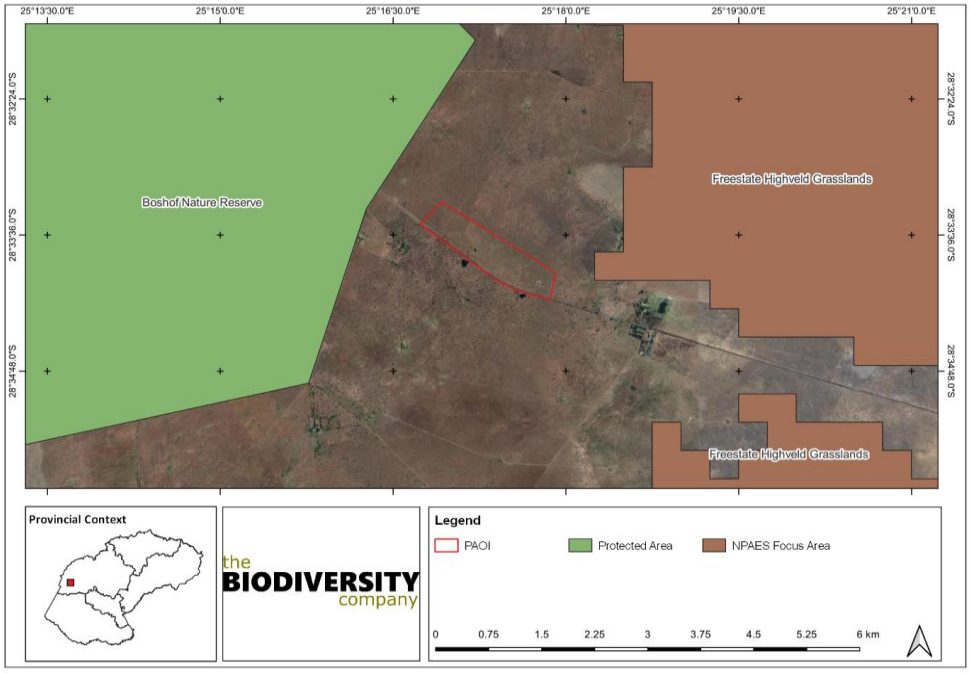


Figure 5.11: Protected Areas Map for the Castor Solar PV Project

Species of Conservation Concern

The POSA database indicates that over 800 species of plants could be expected to occur within and around the site. One (1) of the expected species is classified as a Species of Conservation Concern, based on its conservation status.

Family	Species	Author	SANBI Red-List Status	Ecology
Aizoaceae	*Lithops lesliei subsp. lesliei*	(N.E.Br.) N.E.Br.	NT	Indigenous

Protected Plants in terms of the Free State Nature Conservation Ordinance

The vegetation profile of the landscape may be considered uniform, dominated by *Themeda triandra*, *Aristida congesta* and *Eragrostis lehmanniana* grasses with a strong population of *Vachellia tortilis* subsp. *heteracantha* trees dispersed across the area. Several shrublet and herb species were also noted, such as *Pentzia* spp. and *Laggera decurrens*, in addition to infrequent occurrences of small trees/tall shrubs such as *Searsia lancea*, *Tarchonanthus camphoratus* (more common to the rocky areas), *Ehretia rigida* subsp. *rigida*, *Asparagus laricinus*, and *Ziziphus mucronata*. Several individuals of a provincially protected plant were also recorded, *Brunsvigia radulosa*. The species is protected under Schedule 6 of the Free State Nature Conservation Ordinance 8 of 1969.

Note: Due to the effects of the dry season on the vegetation of the region many indigenous plants occurring in the area may not have been observable or identifiable. Therefore, it is recommended that a wet season walkthrough of the site be conducted prior to the commencement of the project construction phase. This walkthrough may be a requirement of the Environmental Authorisation.

Declared Invasive Alien Species

The Alien and Invasive Species Regulations (GNR 599 of 2014) are stipulated as part of the National Environmental Management: Biodiversity Act (10/2004). The regulation listed a total of 559 alien species as invasive and further 560 species are listed as prohibited and may not be introduced into South Africa. Below is a brief explanation of the four categories of Invasive Alien Plants as per the regulation.

Category 1 plants are prohibited plants which must be controlled or eradicated. These plants serve no economic purpose and possess characteristics that are harmful to humans, animals or the environment.

- Category 1a: Plants are high-priority emerging species requiring compulsory control. All breeding, growing, moving and selling are banned
- Category 1b: Plants are widespread invasive species controlled by a management program.

Category 2 plants are invaders with certain useful qualities, such as commercial use or for woodlots, animal fodder, soil stabilisation, etc. These plants are allowed in demarcated areas under controlled conditions and in biocontrol reserves.

Category 3 plants are alien plants that are currently growing in, or have escaped from areas such as gardens, but that are proven invaders. No further planting is allowed (except with special permission), nor trade in propagative material. Existing plants may remain but must be prevented from spreading. Plants within the flood line and watercourses must be removed (Bromilow, 2010).

One (1) species was recorded during the field survey, namely *Opuntia engelmannii*. This is a Category 1b species which must be controlled through the implementation of an Invasive Alien Plant Management Programme. The exotic tree species *Schinus molle* was also found in certain sections.

5.3.1.3 Wetland Baseline

According to the Wetland Impact and Risk Assessment (Appendix D9) two wetlands were identified within the 500 m regulated area around the site, however located outside of the actual site. The wetland areas were delineated in accordance with the DWAF (2005) guidelines. Both wetlands have been identified as depression wetlands and have been (jointly) assessed. Along with the two wetlands an artificial wetland (cement dam) was identified near the southern boundary of the site. Although this system does not classify as a wetland system it is important to note where this dam is for any planned development in the area. Refer to Figure 5.12.

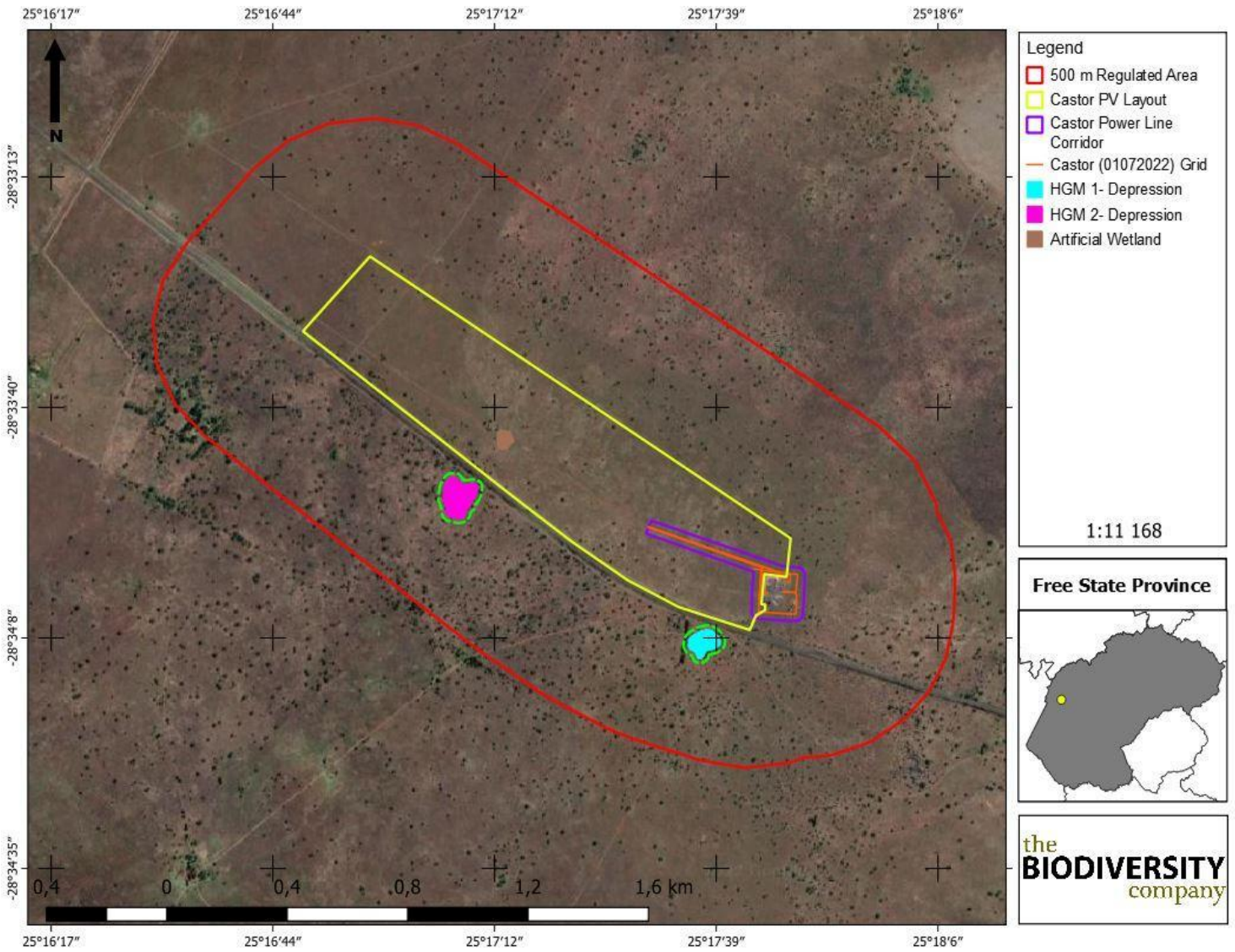


Figure 5.12: Riparian / wetland delineation map of the Castor Solar PV Project

The ecosystem services provided by the wetlands identified within the 500 m regulated area were assessed and rated using the WET-EcoServices method (Kotze *et al*. 2008). Overall, the depressions scored “Intermediate” for ecosystem services. Ecosystem services contributing to these scores include flood attenuation, streamflow regulation, sediment trapping, phosphate assimilation, nitrate assimilation, toxicant assimilation, erosion control, biodiversity maintenance and tourism and recreation.

Due to the wetland type and wetland location on a flat the wetlands do not play such an important role in flood attenuation or streamflow regulation. The wetlands are located inside private property and thus the wetlands will provide little to no cultural benefits to humans. The location of the wetlands also limits the provisioning of resources for people to use. Although the resources are limited the water from the pans are used by the owner of the land for livestock during the dry season. The wetlands have limited to no hydrophyte vegetation that can be used as building material and is also not used for food cultivation.

The wetlands do however host a variety of terrestrial vegetation (trees and shrubs) and will thus provide habitat for species and play an important role in biodiversity maintenance. The assimilation of toxicants, phosphates and nitrates have all been scored “Intermediate” due to the diffuse nature of the wetlands, and the ability to trap sediments. These factors ensure that contaminants are trapped, assimilated by soil and vegetation with the outcome being a less concentrated and cleaner water for human use.

The two depression wetlands will not be directly impacted as these are located outside of the affected property and site/area under assessment, and is also located on the opposite side of the R64 regional road.

5.3.1.4 Climate

The climate of the project area is classified as a hot semi-arid climate (BSh) according to the Köppen–Geiger climate classification system (climate-data.org). Hot semi-arid climates (type "BSh") tend to be located in the 20s and 30s latitudes of the tropics and subtropics, typically in proximity to regions with a tropical savanna or a humid subtropical climate. These climates tend to have hot, sometimes extremely hot, summers and warm to cool winters, with some to minimal precipitation. Hot semi-arid climates are most commonly found around the fringes of subtropical deserts.

In Boshof, the average annual temperature is 18.6 °C and precipitation here is about 500 mm per year. Precipitation is the lowest in July, with an average of 6 mm with the highest precipitation in January, with an average of 82 mm. January is the hottest month of the year with an average temperature of 24.7 °C and the lowest average temperature occurs in July at 10.5 °C.

5.3.1.5 Biodiversity

The primary cause of loss of biological diversity is habitat degradation and loss (IUCN, 2004; Primack, 2006). In the case of this study special attention was given to the identification of sensitive species or animal life and birds on site. The following section will discuss the state of biodiversity on the site in more detail.

Avifauna

According to the Avifaunal Impact Assessment (Appendix D2), three different fine scale habitats occur in the site which includes Grassy Thornveld, Rocky Thornveld and Transformed. Fine-scale habitats within the landscape are important in supporting a diverse avifauna community as they provide differing nesting, foraging and reproductive opportunities. Due to the lack of extensive habitat diversity, no species-habitat associations were observed or inferred during the field survey. Species tended to occur throughout the entire site and surrounding area.

During the field survey a species list was compiled. The avifauna community recorded within the site could be regarded as depauperate with only 21 species recorded, accounting for approximately 11% of the total number of expected species. This is likely attributed to the rather homogenous habitat physiognomy within the site and surrounds. Avifauna communities within arid and semi-arid regions exhibit temporal movements in response to shifts in resource availability. The most speciose family was the Cisticolidae with four species, accounting for approximately 25% of the total number of species recorded.

One of the expected Species of Conservation Concern (SCC) was recorded within the site during the survey period i.e., *Sagittarius serpentarius* (Secretarybird) (Figure 5.13). The species is listed as Vulnerable on a regional scale and Endangered on a global scale. Only a single individual was observed to be foraging within the site (location illustrated in Figure 5.14). However, based on the home range size of this species it will utilise the majority of the site and surrounds and proximal habitats for foraging. The species is known to travel a mean distance of 20-30 km per day while foraging.

Table 5.2 provides a summary of the avifauna species recorded during the survey.

Priority Species' are those avifauna that are particularly susceptible to energy developments, and although these priority species were developed for Wind Energy developments, the type of impact is congruent with solar energy facilities, i.e., collision, electrocution, and habitat loss. Even though the panels may not pose an extensive collision risk for larger avifauna species, power lines associated with the infrastructure, guidelines (anchor lines) and connection lines do pose a risk. The fence could also pose a collision risk for various species. A single priority species was observed within the site, which is the *Sagittarius serpentarius* (Secretarybird), as discussed above.

The dominant species present within the area / site was also identified by the avifauna specialist. Seven of the recorded species accounted for more than 85% of the total number of individuals recorded. The most abundant species was *Plocepasser mahali* (White-browed Sparrow-Weaver)with a relative abundance of 0.39 and a frequency of occurrence of 95.23%. Additional ubiquitous species comprised of *Corvus albus* (Pied Crow) and *Cisticola juncidis* (Zitting Cisticola), with a frequency of occurrence of 57.14% and 23.81%, respectively. These species are generally considered to be common within arid to semi-arid regions, with an increasing expansion of *C. albus* in response to increasing anthropogenic environments and activities. Notably, the increased abundance of *C. albus* has had a concomitant cascading effect within the foodweb due to increased predation pressure on mammals, reptiles, birds and insects.

Plocepasser mahali (White-browed Sparrow-weaver) occurred at the highest density as well as exhibiting the greatest variability at 0.68 ± 0.39 ind.ha-1. Additional species occurring at relatively high densities included *C. albus* (Pied Crow) and *Streptopelia capicola* (Cape Turtle Dove). It is important to note that many of the other species occurred at low densities within the site and surrounds.

Table 5.2: Summary of avifauna species recorded within the proposed Castor Solar PV Project site during the field survey. Species of Conservation Concern are highlighted in bold. EN = Endangered, LC = Least Concern and VU = Vulnerable

Family	Scientific Name	Common Name	Conservation Status	
			Regional	Global
Accipitridae	*Elanus caeruleus*	Kite, Black-winged	LC	LC
Alaudidae	*Mirafra africana*	Lark, Rufous-naped	LC	LC
Cisticolidae	*Cisticola aridulus*	Cisticola, Desert	LC	LC
Cisticolidae	*Cisticola fulvicapilla*	Neddicky	LC	LC
Cisticolidae	*Cisticola juncidis*	Cisticola, Zitting	LC	LC
Cisticolidae	*Prinia flavicans*	Prinia, Black-chested	LC	LC
Columbidae	*Streptopelia capicola*	Dove, Cape Turtle	LC	LC
Corvidae	*Corvus albus*	Crow, Pied	LC	LC
Estrildidae	*Ortygospiza atricollis*	Quailfinch, African	LC	LC
Falconidae	*Falco rupicoloides*	Kestrel, Greater	LC	LC
Falconidae	*Falco rupicolus*	Kestrel, Rock	LC	LC
Lybiidae	*Lanius collaris*	Fiscal, Southern	LC	LC
Lybiidae	*Tricholaema leucomelas*	Barbet, Acacia Pied	LC	LC
Muscicapidae	*Cercotrichas paena*	Robin, Kalahari Scrub	LC	LC
Muscicapidae	*Oenanthe familiaris*	Chat, Familiar	LC	LC
Numididae	*Numida meleagris*	Guineafowl, Helmeted	LC	LC
Ploecidae	*Plocepasser mahali*	Sparrow-weaver, White-browed	LC	LC
Sagittariidae	***Sagittarius serpentarius***	**Secretarybird**	**VU**	**EN**
Struthionidae	*Struthio camelus*	Ostrich, Common	LC	LC
Sturnidae	*Lamprotornis nitens*	Starling, Cape Glossy	LC	LC
Sylviidae	*Curruca subcoerulea*	Tit-Babbler, Chestnut vented	LC	LC

Observing and monitoring flight paths and nesting sites of SCC and/or priority species are important in ascertaining habitat sensitivity and evaluating the impact risk significance of any proposed development.

Nesting sites were located for only two species within the site with no nests of SCC observed. The low number of species recorded nesting within the site should be interpreted with caution because the survey was undertaken during the dry season, and it is postulated that more species are likely to be nesting during the onset of the wet season. This is especially considering the density of large *Vachellia tortilis subsp. heteracantha* observed. Notably, flat-topped *Vachellia* species are favoured by *S. serpentarius* for nesting sites.

Nests of avifauna species recorded within the site includes *Struthio camelus* (Common Ostrich) and *Plocepasser mahali* (White-browed Sparrow-weaver).

Figure 5.13: Photographs illustrating a portion of the avifauna recorded within the site during the field survey. A) *Prinia flavicans* (Black-chested Prinia), B) *Lamprotornis nitens* (Cape Glossy Starling) and C-D) *Sagittarius serpentarius* (Secretarybird)

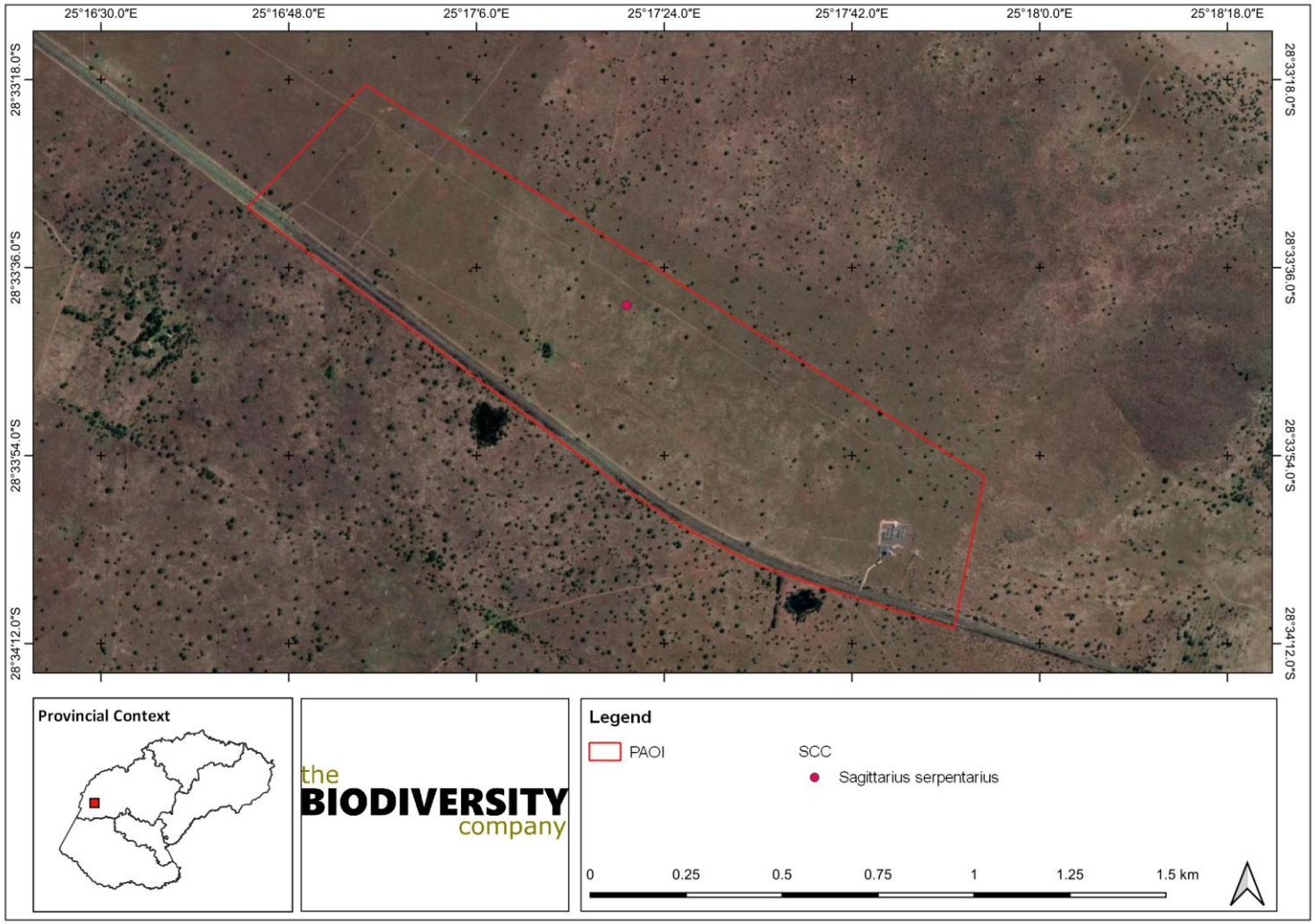


Figure 5.14: Map illustrating the location of avifauna Species of Conservation Concern within the proposed Castor Solar PV Project

Fauna

- **Mammals**

The IUCN Red List spatial database, in addition to the MammalMap database, lists over 70 mammal species that could be expected to occur within and around the site. This list includes large mammal species that are typically limited to reserves due to the fact that the site occurs nearby to a nature reserve and game farming is considered a common activity in the region. Nine (9) of these expected species are regarded as SCC, and of these SCC seven (7) have a moderate or high likelihood of occurrence based on the presence of suitable habitat and food sources in the area.

Table 5.3 provides an indication of the SCC mammals that could occur in the area.

Table 5.3: SCC mammal species that may occur within the site and surrounds

Species	Common Name	Conservation Status		Likelihood of Occurrence
		SANBI (2022)	IUCN (2021)	
Atelerix frontalis	Southern African Hedgehog	NT	LC	High
Equus quagga	Plains Zebra	LC	NT	Moderate
Felis nigripes	Black-footed Cat	VU	VU	Moderate
Hippotragus equinus	Roan Antelope	EN	LC	Moderate
Hippotragus niger niger	Sable Antelope	VU	LC	High
Mystromys albicaudatus	African White-tailed Rat	VU	VU	Moderate
Pelea capreolus	Vaal Rhebok	NT	NT	Moderate
Poecilogale albinucha	African Striped Weasel	NT	LC	Moderate
Redunca fulvorufula	Mountain Reedbuck	EN	EN	Low
Smutsia temminckii	Ground Pangolin	VU	VU	Low

Medium to large mammal activity was high in the area due to the relatively low levels of disturbance present and the fact that it is used as a game farm, or it is connected to a larger game farm area. Nine (9) mammal species were observed, several of which are considered SCC and/or protected fauna. No herpetofauna species were recorded during the survey. A larger number of mammals and herpetofauna species are expected to occur in the area.

It is noted that provincial protection is as per the Free State Nature Conservation Ordinance 8 of 1969, whereby schedule 1 species may not be hunted except under the authority of a permit. *Kobus leche* (Lechwe) is regarded as an introduced species as its native range is limited to parts of central Africa.

Table 5.4 provides a list of the mammal species recorded during the survey.

Table 5.4: The mammal species recorded during the field survey

Species	Common Name	Conservation Status		Protection
		SANBI (2022)	**IUCN (2021)**	
Alcelaphus buselaphus	Red Hartebeest	LC	LC	Provincial, Schedule 2
Hippotragus niger niger	Sable Antelope	VU	LC	Provincial, Schedule 1
Kobus ellipsiprymnus ellipsiprymnus	Waterbuck	LC	LC	Provincial, Schedule 2
Kobus leche	Lechwe	-	NT	
Raphicerus campestris	Steenbok	LC	LC	Provincial, Schedule 2
Suricata suricatta	Meerkat	LC	LC	
Sylvicapra grimmia	Common Duiker	LC	LC	Provincial, Schedule 2
Tragelaphus oryx	Common Eland	LC	LC	Provincial, Schedule 2
Xerus inauris	South African Ground Squirrel	LC	LC	

- **Reptiles**

  Based on the IUCN Red List spatial database and the ReptileMap database, over 40 reptile species may be expected to occur within and nearby to the site. None of these species are regarded as SCC.

- **Amphibians**

  Based on the IUCN Red List spatial database and FrogMap, over 10 amphibian species may be expected to occur within and nearby to the site. One (1) of these is regarded as an SCC however it is assigned a low likelihood of occurrence due to the lack of suitable wetland habitat available. The species is the *Pyxicephalus adspersus* (Giant Bull Frog).

5.3.1.6 Visual landscape

The site is located in an area with relatively low significance in elevation, meaning that the site is not located on a mountain, at the foot of a mountain or in an area with a significant difference in elevation. The preferred site is located at an above mean sea level (amsl) of approximately 1286m at the highest elevation and at an amsl of 1270m at the lowest elevation. The area drains to the north west, towards Boshof.

The landform and drainage described above is unlikely to limit visibility. Areas within 5km from the proposed development might have a clear view without taking existing screening into account.

Potential receptors within the landscape has been identified within the Visual Impact Assessment (Appendix D3). Area receptors, linear receptors and point receptors have been identified.

- Area receptors include the towns of:
    - Boshof
    - Seretse
- Linear receptors which include:
    - R64 regional road (tar road)
    - Gravel roads (name signs of these gravel roads were either removed or stole, and no names are available on satellite imagery)
- Point receptors which include:
    - Farmsteads
    - Smallholdings
    - Sports and recreational facilities
    - Tourism and lodging facilities

In terms of possible landscape degradation, the landscape does not appear to have any specific protection or importance and is characterised by farming development. Figure 5.15 and Figure 5.16 below indicates the Zone of Theoretical Visibility (ZTV) for the PV facility and the proposed power line.

The ZTV assessment did not consider existing screening such as buildings and vegetation cover but rather the terrain's above mean sea level (AMSL) which indicates line of sight. The main visual receptors in the area are Boshof, Seretse (an area located in the town of Boshof), homesteads on farms and the R64 regional road.

The ZTV assessment indicates that within a 0-5km radius both the solar project and the associated power line will be highly visible to the following visual receptors:

- Seretse
- Boshof
- Four homesteads on farms
- R64 regional road (tar road)
- Two gravel roads

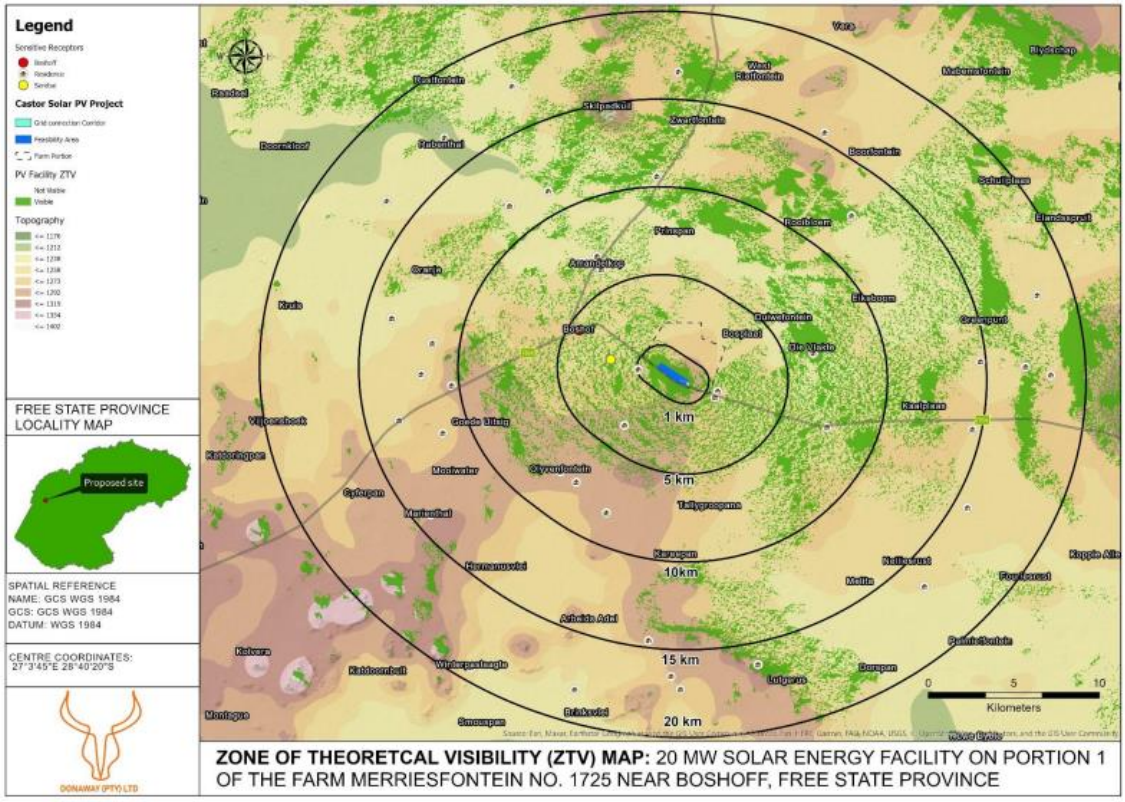


Figure 5.15: Zone of Theoretical Visibility (ZTV) for the Castor Solar PV Project

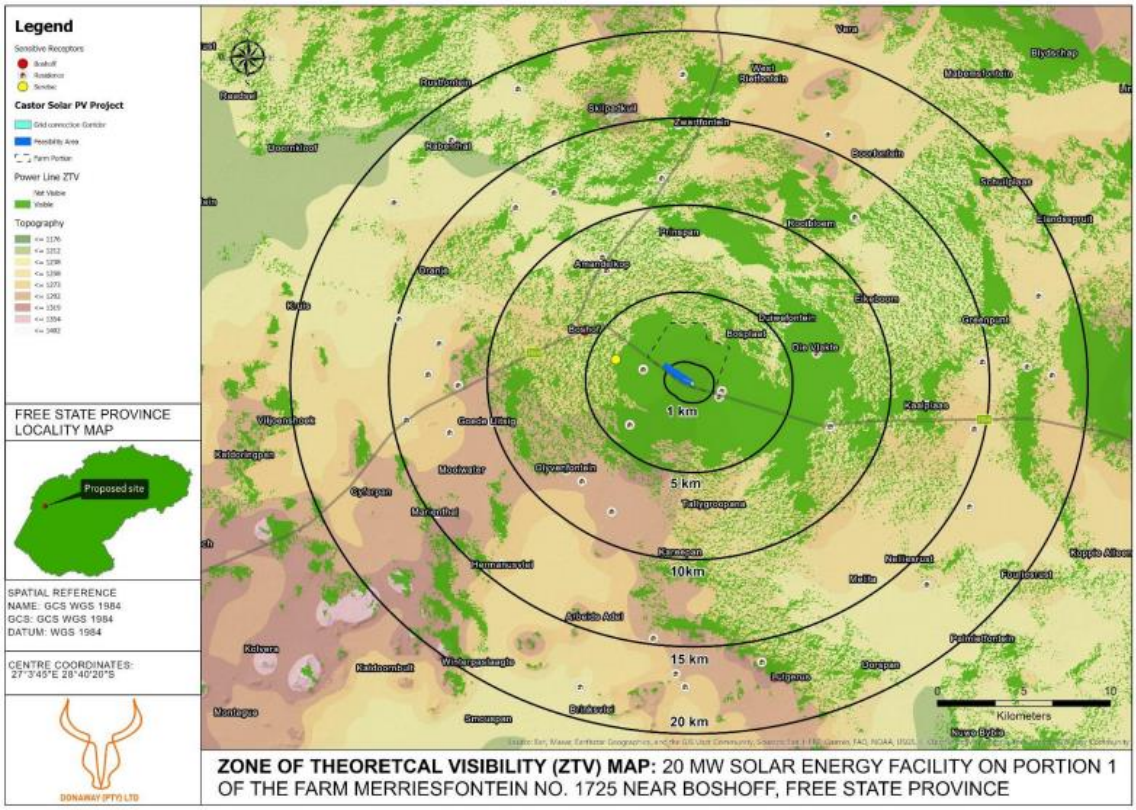


Figure 5.16: Zone of Theoretical Visibility (ZTV) for the power line associate with the Castor Solar PV Project

5.3.1.7 Traffic consideration

According to the Traffic Impact Assessment (Appendix D8), the existing external road network, in the vicinity of the Castor Solar PV Project consists of the R64, S342 and S400. Access to the Castor Solar PV Project will be via the R64 regional road, to the south of the site. Refer to Figure 5.17. The existing gravel road off of the R64 will need to be strengthened, widened and extended for the proposed development. A tee-off from the existing access road to the top end of the site will also be required.

A formal application for the recommended access points will need to be lodged with the Tokologo Local Municipality and the Free State Department: Police, Roads and Transport. The formalisation of this access point to the standard, will in all probability be a requirement as part of the wayleave approval.

It is anticipated that approximately 1 km of internal roads will be required and an additional 15 km of smaller stracks may be required for cleaning and maintenance of the solar facility.

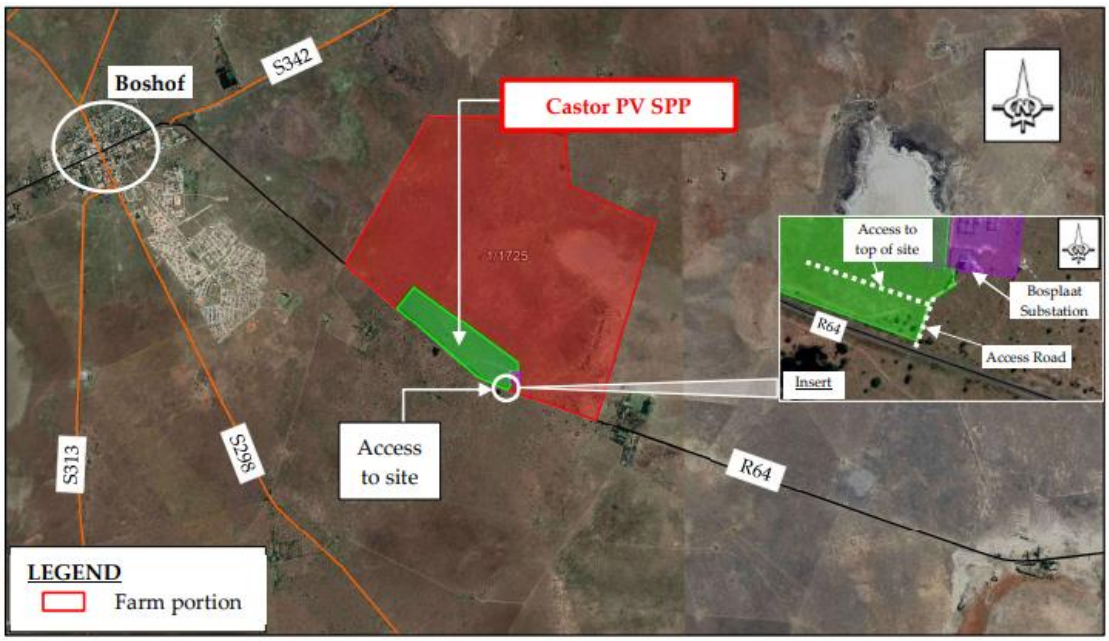


Figure 5.17: Proposed access point and roads associated with the Castor Solar PV Project

Two (2) possible ports of entry has been identified from where the solar panel technology and large electrical components will be transported, namely: Durban (752 km) and Richards Bay (915 km). Based on the shortest travel distance, it is recommended that the Port of Durban be the preferred port of entry. The Port of Durban is South Africa's main cargo and container port, handling the largest volume of sea-going traffic of any port in southern Africa. It is ideally placed on major shipping routes and have excellent rail and road links. Refer to Figure 5.18.

Figure 5.18: The preferred route for imported components.

5.3.2 Description of the socio-economic environment

The socio-economic environment is described with specific reference to social, economic, heritage and cultural aspects.

5.3.2.1 Socio-economic conditions

According to the Social Impact Assessment (Appendix D7) the Free State Province is the landlocked core of the country. It is centrally placed, with good transport corridors to the north and the coast. It is the third biggest of South Africa's nine provinces in terms of size, and primary agriculture is a key economic sector. Mining is also important but has been declining steadily since 2008. Although the Free State is the third-largest province in South Africa, it has the second-smallest population and the second-lowest population density. It covers an area of 129 825km² and has a population of 2 834 714 – 5.1% of the national population. Languages spoken include Sesotho (64.4%), Afrikaans (11.9%) and Zulu (9.1%). The Free State Province contributes 5.4% to South Africa's total gross domestic product.

Agriculture is a key economic sector – 8% of the country's produce comes from Free State. In 2010, agriculture provided 19.2% of all formal employment opportunities in the region. The economy is dominated by agriculture, mining and manufacturing. Known as the 'bread-basket' of South Africa, about 90% of the province is under cultivation for crop production. It produces approximately 34% of the total maize production of South Africa, 37% of wheat, 53% of sorghum, 33% of potatoes, 18% of red meat, 30% of groundnuts and 15% of wool. The province is the world's fifth-largest gold producer, with mining the major employer. Manufacturing also features in the provincial economic profile. This sector makes up 14% of the provincial output, with petro-chemicals (via Sasol) taking account of more than 85% of the output.

The Lejweleputswa District Municipality is a Category C municipality situated in the north-western part of the Free State. It borders the North West Province to the north, Fezile Dabi and Thabo Mofutsanyana to the north-east and east respectively, Mangaung and Xhariep to the south, and the Northern Cape Province to the west.

The District Municipality makes up almost a third of the province, covering an area of 32 287km^2 , and consists of the following five local municipalities, with approximately 18 towns distributed throughout: Masilonyana, Tokologo, Tswelopele, Tokologo and Nala. It is accessible from Johannesburg, Cape Town, Klerksdorp and Kimberley along the N1, one of the country's main national roads.

The main economic sectors include: Mining (31%), construction, transport, electricity and trade. In 2011 the Municipality had a population of 624 746 with a dependency ratio of 51.3. By 2016 the population has increased to 646 920 and the dependency ratio was reduced to 46.2

The Tokologo Local Municipality is a Category B municipality located within the Lejweleputswa District Municipality in the western Free State Province. It is bordered by the North West Province in the north, the Xhariep District in the south, Tswelopele and Masilonyana in the east, and the Northern Cape Province in the west. It is one of five municipalities in the district, making up almost a third of its geographical area.

Tokologo Local Municipality covers an area of 9316 km^2 with agriculture as the main economic activity. Boshof (the capital town) is situated in the centre, Dealesville is further east, and Hertzogville is situated in the north of the municipal area. There are no formally protected areas in this Local Municpality and Game farming seems to be most present in this area that supports conservation in a meaningful manner.

Most of the surrounding area to the site has a low number of farmsteads that are sparsely populated. The area is located within an agricultural region, and the immediate area is presently used mainly for cattle and game farming.

5.3.2.2 Cultural and heritage aspects

According to the Heritage Impact Assessment (Appendix D5) special attention was given to the identification of possible cultural or heritage resources on site.

Stone Age

The larger region has probably been inhabited by humans since Early Stone Age (ESA) times, although evidence of this is very limited. Tools dating to this period are mostly, although not exclusively, found in the vicinity of watercourses. The oldest of these tools are known as choppers, crudely produced from large pebbles found in the river. Later, Homo erectus and early Homo sapiens people made tools shaped on both sides, called bifaces. Such tools, dating to the Fauresmith industry, a transitional stage between the Early Stone Age and the Middle Stone Age are known from the region the to the southwest of the site.

During Middle Stone Age (MSA) times (c. 150 000 – 30 000 BP), people became more mobile, occupying areas formerly avoided. Open sites were still preferred near watercourses. These people were adept at exploiting the huge herds of animals that passed through the area, on their seasonal migration. As a result, tools belonging to this period also mostly occur in the open or in erosion

dongas. Similar to the ESA material, artefacts from these surface collections are viewed not to be in a primary context and have little or no significance.

Later Stone Age (LSA) people had even more advanced technology than the MSA people and therefore succeeded in occupying even more diverse habitats. The stone artefacts they produced are much smaller than those of the Middle Stone Age and consist of a great variety of functional types. LSA people preferred, though not exclusively, to occupy rock shelters and caves and it is this type of sealed context that make it possible for us to learn much more about them than is the case with earlier periods. At present, no stratified, sealed site dating to the Stone Age is known for the immediate region.

Iron Age

Iron Age people started to settle in southern Africa c. AD 300, with one of the oldest known sites at Silver Leaves south east of Tzaneen dating to AD 270. The oldest local EIA site is located at Broederstroom south of Hartebeestpoort Dam and has a radio-carbon date of AD 470.

The occupation of the larger geographical area (including the site) did not start much before the 1500s. Towards the end of the first millennium AD, Early Iron Age communities underwent a drastic change, brought on by increasing trade on the East African coast. This led to the rise of powerful ruling elites, for example at Mapungubwe. The abandonment of Mapungubwe (c. AD 1270) and other contemporaneous settlements show that widespread drought conditions led to the decline and eventual disintegration of this state, Huffman (2005).

By the 16th century things changed again, with the climate becoming warmer and wetter, creating conditions that allowed Late Iron Age (LIA) farmers to occupy areas previously unsuitable, for example the Witwatersrand and the treeless, wind-swept plains of the Free State and the Mpumalanga escarpment.

This period of consistently high rainfall started in about AD 1780. At the same time, maize was introduced from Maputo and grown extensively. Given good rains, maize crops yield far more than sorghum and millets. This increase in food production probably led to increased populations in coastal areas as well as the central highveld interior by the beginning of the 19th century. Due to their specific settlement requirements, Late Iron Age people preferred to settle on the steep slope of a mountain, possibly for protection, or for cultural considerations such as grazing for their enormous cattle herds. Because of the lack of trees, they built their settlements in stone.

The complexity of these communities, as is reflected in their settlement layout, has been demonstrated for example by the extensive archaeological excavations done on some of these sites by Tim Maggs (Maggs 1976).

Historic period

European hunting parties allegedly crossed the Orange River in the first two decades of the 19th century, exploring as far as the current Wepener district. On the heels of these explorers, cattle farmers from the Cape Colony started moving out of the northern Cape Colony borders from 1821 for seasonal grazing, but did not encounter any Bantu-speaking people. Driven by droughts in the Cape, loss of livestock during the seasonal travels and the uninhabited district of the Transgariep led to numerous farmers settling themselves permanently in the area after 1824.

Between 1825 and 1841 European settlers started to occupy the area of the Modder River between the Orange and Caledon Rivers, west of Langeberg. In 1829 Rudolph van Wyk settled on the farm Rietpoort, where the town of Smithfield was founded in 1848, and P.E. Wepener claimed the farm Zuurbult, which would become Rouxville in 1863. Roughly at the same time fifteen families occupied the farm Zevenfontein which eventually became the Beersheba Mission Station. The town of Zastron was founded on the farm named Verliesfontein, which was settled between 1836 and 1840, and by that time nearly 300 families had settled in the area currently known as the Eastern Free State. During the beginnings of the 1830's a new, organised group of European settlers, the forerunners of the Groot Trek, saw a large but temporary influx of settlers. During this time A.H. Potgieter also bought land from the Bataung captain Makwana in 1836.

The historic period started with the arrival, in the late 18th century by Korana raiders in the area. They were soon followed, in the early 19th century, by traders, explorers and missionaries. By the middle of the 19th century, farms were taken up and later towns were developed.

In 1855 the white inhabitants of the ward Lower Modder River appointed a commission to promote the establishment of a parish and village in the region. The farm Vanwyksvlei was selected for this purpose as it was well watered. It was bought for 24, 000 rix-dollars from a David Fourie. The latter bartered for the farm in 1839 from its original, the Korana chief David Danster, for a saddle horse and 16 sheep. The town was registered 1856 and the first plots of land were sold. Pres. J.N. Boshof of the Orange Free State Republic agreed to the 'godfather' to the town, which was named in his honour. The Afrikaner folk-dance and -song movement under the leadership of Dr S H Pellisier had its first rally here.

On 13 March 1900 Bloemfontein fell to Lord Roberts. While he stayed there in order to allow the army to regroup and recover, some Republicans undertook a few operations in the larger region. One such was a movement by the European Legion, under the command of the Frenchman Count G. H. A. V. de Villebois-Mareuil, who had the rank of Vecht-general. He was a strong critic of the Republicans' tactics and discipline and, in an attempt to demonstrate correct military conduct, he set off to attack the British forces at the town of Boshof. Under his command was a force of 150 men, supported by an equal number of Republicans.

Villebois-Mareuil was under the impression that Boshof was occupied only by some 200 to 300 British. Although being warned that this information was wrong, he persisted in advancing towards the town. What he did not know was that a force under Lord Methuen had moved up from Kimberley towards Bloemfontein via Boshof and the Count found himself and his men seriously outnumbered. When some 750 men of the Imperial Yeomanry, Kimberley Mounted Corps and 4th Battery, Royal Field Artillery came across the commando, instead of prudently retreating, Villebois-Mareuil took up positions on two kopjes, his Frenchmen on one, the Republicans on the other. The battle lasted for three hours, during which the Republicans surrendered, and the French defiantly fought on. The Count was killed by shellfire as the British were making their final attack with bayonets.

Some eye-witness accounts would have it that the Count was shot in the back while fighting the British soldiers. A small monument was erected in his honour at the site where he died

Site Specific Review and Results:

From a review of the available old maps and aerial photographs it can be seen that the site has always been open space, with the main activity being grazing or the making of agricultural fields.

From the early aerial photographs and topographic maps, the only development to be seen are grazing fields, dams and access roads.

No sites, features or objects of cultural significance dating to the Stone Age, Iron Age or historic period were identified in the site.

Palaeontology

The Heritage Impact Assessment (Appendix D5) has confirmed that the site proposed for the is located within areas of zero to insignificant sensitivity from a palaeontological perspective, based on the PalaeoSensitivity Map of the South African Heritage Resources Agency (SAHRA). The full extent of the site is located within areas demarcated as Grey and therefore no palaeontological assessment is required. However, the interim comments received from SAHRA has requested that a desktop study be undertaken (Appendix C5). Based on the nature of the specialist field, i.e. palaeontology, it was deemed as sufficient to consider the desktop palaeontological assessment undertaken for the previous process (proposed Boshof – Les Marais / Buitefontein Solar Energy Facility Reference number 14/12/16/3/3/1/1090).

According to the Palaeontological Impact Assessment (Appendix D6) the fossil record of the Tierberg Formation has been reviewed in detail by Almond (2008a). Rare body fossil records include disarticulated microvertebrates (e.g. fish teeth and scales) from calcareous concretions in the Koffiefontein sheet area (Zawada 1992) and allochthonous plant remains (drifted leaves, petrified wood). The latter become more abundant in the upper, more proximal (prodeltaic) facies of the Tierberg (e.g. Wickens 1984). Prinsloo (1989) records numerous plant impressions and unspecified "fragmentary vertebrate fossils" (possibly temnospondyl amphibians) within fine-grained sandstones in the Britstown sheet area. Dark carbonaceous Ecca mudrocks are likely to contain palynomorphs (e.g. pollens, spores, acritarchs). Bosch (1993) and Visser et al. (1977) briefly mention body fossils within the Tierberg mudrocks in the broader Kimberley region. Concretions within the lower part of the formation at Kaffirs Kop 193 (southeast of Belmont) and on Klippiespan 205 contain fish scales, coprolites and sponge spicules. Records of abundant silicified wood within the upper Tierberg succession near De Aar are better referred to the Waterford Formation (cf Almond 2012, 2013).

The commonest fossils by far in the Tierberg Formation are sparse to locally concentrated assemblages of trace fossils that are often found in association with thin event beds (e.g. distal turbidites, prodeltaic sandstones) within more heterolithic successions. A modest range of ten or so different ichnogenera have been recorded from the Tierberg Formation (e.g. Abel 1935, Anderson 1974, 1976, Wickens 1980, 1984, 1994, 1996, Prinsloo 1989, De Beer et al., 2002, Viljoen 2005, Almond 2008a). These are mainly bedding parallel, epichnial and hypichnial traces, some preserved as undertracks. Penetrative, steep to subvertical burrows are rare, perhaps because the bottom sediments immediately beneath the sediment / water interface were anoxic. Most Tierberg ichnoassemblages display a low diversity and low to moderate density of traces. Apart from simple back-filled and / or lined horizontal burrows (*Planolites, Palaeophycus*) they include arthropod trackways (*Umfolozia*) and associated resting impressions (*Gluckstadtella*), undulose fish swimming trails (*Undichna*) that may have been generated by bottom-feeding palaeoniscoids, horizontal epichnial furrows (so-called *Scolicia*) often attributed to gastropods (these are also common in the co-eval Collingham Formation; Viljoen 1992, 1994), arcuate, finely-striated feeding excavations of an unknown arthropod (*Vadoscavichnia*), beaded traces ("*Hormosiroidea*" or "*Neonereites*"), small sinusoidal surface traces (*Cochlichnus*), small star-shaped feeding burrows (*Stelloglyphus*) and zigzag

horizontal burrows (*Beloraphe*), as well as possible narrow (<1cm) *Cruziana* scratch burrows. The symmetrical, four-pronged trace *Broomichnium* (= *Quadrispinichna* of Anderson, 1974 and later authors) often occurs in groups of identical size (c. 3.5cm wide) and similar orientation on the bedding plane. This trace has frequently been misinterpreted as a web-footed tetrapod or arthropod trackway (e.g. Van Dijk et al. 2002 and references therein). However, Braddy and Briggs (2002) present a convincing case that this is actually a current-orientated arthropod resting trace (cubichnion), probably made by small crustaceans that lived in schools of similarsized individuals and orientated themselves on the seabed with respect to prevailing bottom currents. Distinctive broad (3-4 cm), strap-shaped, horizontal burrows with blunt ends and a more-or-less pronounced transverse ribbing occur widely within the Tierberg mudrocks. They have been described as "fucoid structures" by earlier workers (e.g. Ryan 1967) by analogy with seaweeds, and erroneously assigned to the ichnogenera *Plagiogmus* by Anderson (1974) and *Lophoctenium* by Wickens (1980, 1984). Examples up to one metre long were found in Tierberg mudrocks near Calvinia in 1803 by H. Lichtenstein, who described them as "eel fish". These are among the first historical records of fossils in South Africa (MacRae 1999). These as yet unnamed burrows are infilled with organized arrays of faecal pellets (Werner 2006). Sandstone sole surfaces with casts of complex networks of anastomosing (branching and fusing) tubular burrows have been attributed to the ichnogenus *Paleodictyon* (Prinsloo 1989) but may more appropriately assigned to *Megagrapton* (Almond 1998). These so-called graphoglyptid burrows are associated with turbidite facies from the Ordovician to Recent times and have been interpreted as gardening burrows or *agrichnia* (Seilacher, 2007). Microbial mat textures, such as *Kinneyia*, also occur in these offshore mudrocks but, like the delicate grazing traces with which they are often associated, are generally under-recorded.

Late Caenozoic calcretes may contain trace fossils such as rhizoliths, termite and other insect burrows, or even mammalian trackways. Mammalian bones, teeth and horn cores (also tortoise remains, and fish, amphibian or even crocodiles in wetter depositional settings such as pans; Partridge & Scott 2000) may be expected occasionally expected within Kalahari Group sediments and calcretes, notably those associated with ancient, Plio-Pleistocene alluvial gravels.

The Karoo Dolerite suite comprises intrusive igneous rocks that do not contain fossils (Duncan & Marsh 2006).

The desktop report confirmed that the broader area within which the Castor Solar PV Project is located is generally of a medium to low sensitivity, and the approximate location of the site lies within the Karoo dolerite outcrop area that is of a very low palaeontological sensitivity.

5.4 SITE SELECTION MATRIX

Due to the nature of the proposed development, the location of the facility is largely dependent on technical and environmental factors such as solar irradiation, climatic conditions, topography of the site, sensitive environmental features or areas, access to the grid and capacity of the grid. Studies of solar irradiation worldwide indicate that the Free State Province has a huge potential for the generation of power from solar.

The receptiveness of the site to the proposed development includes the presence of optimal conditions for the siting of a solar energy facility due to high irradiation values and optimum grid connection opportunities (which are located within the affected property). The site where the project is proposed to be located is considered favourable and suitable from a technical perspective due to the following characteristics:

- **Climatic conditions:** Climatic conditions determine if the project will be viable from an economic perspective as the solar energy facility is directly dependent on the annual direct solar irradiation values of a particular area. The Free State receives a high average of direct normal and global horizontal irradiation daily. This is an indication that the regional location of the project includes a low number of rainy days and a high number of daylight hours experienced in the region. Global Horizontal Radiation of 2148 kwh/m^2 per year is relevant in the area.

- **Renewable Energy Development Zone (REDZ):** The site is also located in the Kimberley Renewable Energy Development Zones (REDZ). The solar PV assessment domain was based on the location of the majority of existing solar PV project applications at the commencement of the Strategic Environmental Assessment (SEA) and includes the five provinces of Northern Cape, Western Cape, Eastern Cape, Free State and North West.

- **Site availability and access:** The land is available for lease by the developer and consent has been provided by the affected landowner for the undertaking of the BA process on the affected property. Reluctant farm owners or farmers over capitalizing hamper efforts to find suitable farms. Access will be easily obtained via the R64 regional road located to the south of the site.

- **Grid connection**: Connecting the PV plant to the electrical grid requires transformation of voltage to 22kV or 66kV. Specific power line infrastructure will be required. An onsite substation and switching stations will be required on the site to step the voltage up to 22kV or 66kV, after which the power will be evacuated into the national grid via a new proposed power line. It is expected that generation from the facility will tie in with the existing Bosplaat Rural Substation located within the affected property.

  Five power line routes have been assessed within a grid connection corridor of between 50 and 200m wide, which will connect the project to the existing Eskom substation compound. All five route options fall within the grid connection corridor proposed and assessed and all five are considered to be technically feasible. Following inputs from the independent specialists a high ecological sensitivity habitat was identified, known as the Rocky Thornveld habitat. Route Option 5 traverses this habitat area and therefore direct impact was expected. The Applicant has however discarded Route Option 5 due to this potential environmental impact, and therefore only one of the four other options located within the grid connection corridor will be developed for the project.

  Available grid connections are becoming scarce and play a major role when selecting a viable site. The options available to the Applicant for the Castor Solar PV Project are considered desirable based on the proximity of the grid connection point and the opportunity to limit the development of grid connection infrastructure.

- **Environmental sensitivities:** From an environmental perspective the proposed site/development footprint is considered desirable due to limited environmental sensitivities in terms of geology, and soils, agricultural potential, vegetation and landscape features, climate, biodiversity and ecological features and the visual landscape – refer to Section 5.3.1 of this report. The extent of the site (~72ha) vs. the extent of the development footprint proposed to be developed within the site (i.e. 40ha) provides an opportunity to

avoid the sensitive environmental features and areas as it provides flexibility for the placement of the infrastructure.

It is evident from the discussion above that the area and development footprint under assessment may be considered favourable and suitable in terms of these site characteristics. As mentioned previously, no alternative areas within the affected property have been considered. However, provision was made for the avoidance of the areas that the landowner considers as valuable for the current land use activities being undertaken.

The site selection is also supported by the fact that a solar energy facility, although of a smaller capacity, was previously authorised within the same affected property and area.

5.5 CONCLUDING STATEMENT ON ALTERNATIVES

When considering the information provided by the specialists with regards to the site selection criteria and the comparison, the site is identified as preferred due to the fact that the opportunities presented on the site to develop the project in such a way which avoids the areas and features of environmental sensitivity.

Therefore, development of the up to 20MW Castor Solar PV Project on the Portion 1 of the Farm Merriesfontein No. 1725, is the preferred option. The preferred layout designed within the site is included in the attached Appendix G. It is therefore concluded that no other alternatives are considered as part of the BA process.

For the grid connection option considered, it can be concluded that the proposed grid connection corridor is appropriate from an environmental perspective due to the absence of sensitive environmental features.

6 DESCRIPTION OF THE IMPACTS AND RISKS

This section aims to address the following requirements of the regulations:

Appendix 1. (3)(i) An BAR (...) must include-

(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 location through the life of the activity, including-

(i) a description of all environmental issues and risks that were identified during the EIA 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.

(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;

(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 report;

6.1 SCOPING METHODOLOGY

The contents and methodology of the Basic Assessment report aimed to provide, as far as possible, a user-friendly analysis of information to allow for easy interpretation.

- Checklist (see section 6.1.1): The checklist consists of a list of structured questions related to the environmental parameters and specific human actions. They assist in ordering thinking, data collection, presentation and alert against the omission of possible impacts.
- Matrix (see section 6.1.2): The matrix analysis provides a holistic indication of the relationship and interaction between the various activities, development phases and the impact thereof on the environment. The method aims at providing a first order cause and effect relationship between the environment and the proposed activity. The matrix is designed to indicate the relationship between the different stressors and receptors which

leads to specific impacts. The matrix also indicates the specialist studies that have been conducted to address the potentially most significant impacts.

6.1.1 Checklist analysis

The independent consultant conducted a site visit on 27 May 2022. The site visit was conducted to ensure a proper analysis of the site specific characteristics of the site. Table 6.1 provides a checklist, which is designed to stimulate thought regarding possible consequences of specific actions and to assist scoping of key issues. It consists of a list of structured questions related to the environmental parameters and specific human actions. They assist in ordering thinking, data collection, presentation and alert against the omission of possible impacts. The table highlights certain significant issues, which are further analysed in matrix format in section 6.2.

Table 6.1: Environmental checklist

QUESTION	YES	NO	Un-sure	Description
1. Are any of the following located on the site earmarked for the development?				
I. A river, stream, dam or wetland		☒		None.
II. A conservation or open space area	☒			The site under assessment is located within an ESA 1 and ESA 2.
III. An area that is of cultural importance		☒		None.
IV. Site of geological/palaeontological significance		☒		The site and general area is considered as unfossiliferous.
V. Areas of outstanding natural beauty		☒		None.
VI. Highly productive agricultural land		☒		Areas within the affected property and site are used for grazing and game farming, however crop production opportunities are very limited.
VII. Floodplain		☒		None.
VIII. Indigenous Forest		☒		None.

IX. Grass land	☒			The site is situated within Kimberley Thornveld of the Eastern Kalahari Bushveld Bioregion, existing adjacent to the grassland biome. This vegetation type is classified as 'Least Threatened'.
X. Bird nesting sites	☒			Nesting sites were located for only two species within the site with no nests of Species of Conservation Concern observed. However, flat-topped *Vachellia* species are favoured by *S. serpentarius* for nesting sites.The density of large *Vachellia tortilis subsp. heteracantha* observed is noted. Notably, nests of avifauna species recorded within the site includes *Struthio camelus* (Common Ostrich) and *Plocepasser mahali* (White-browed Sparrow-weaver).
XI. Red data species / Species of Conservation Concern	☒			One of the expected SCC was recorded within the site during the survey period i.e., *Sagittarius serpentarius* (Secretarybird). The species is listed as Vulnerable on a regional scale and Endangered on a global scale. Only a single individual was observed to be foraging within the site.
XII. Tourist resort		☒		None.
2. Will the project potentially result in potential?				
I. Removal of people		☒		None.

II. Visual Impacts	☒			The VIA (refer to Appendix D3) confirmed that the development will have a negative low visual impact on observers. The only receptors likely to be impacted by the proposed development are the nearby property owners and road users on nearby roads. However, a large part of the visual landscape is still reflecting a farming landscape with a better visual appearance.
III. Noise pollution		☒		Construction activities will result in the generation of noise over a period of months. However, the site is located adjacent to a regional road and the noise will only be temporary and associated with the construction phase.
IV. Construction of an access road	☒			Access will be obtained via the existing R64 regional road. Internal access roads will be constructed for the facility.
V. Risk to human or valuable ecosystems due to explosion/fire/ discharge of waste into water or air.		☒		None.
VI. Accumulation of large workforce (>50 manual workers) into the site.	☒			Approximately 100 employment opportunities will be created during the construction and 10 employment opportunities during the operation phase.
VII. Utilisation of significant volumes of local raw materials such as water, wood etc.	☒			An estimated 1.5 to 2 million litres of water would be required during the construction. For operations, approximately 500,000 litres (or 500 m^3) of water per annum is proposed to be trucked in from the nearest water source as per a water purchase agreement from a local authorised user or service provider.

VIII. Job creation	☒			Approximately 100 employment opportunities will be created during the construction and 10 employment opportunities during the operation phase.
IX. Traffic generation	☒			It is estimated that on average 19 trips per day will be generated over the construction period. This will however differ during the different stages of construction.
X. Soil erosion	☒			The site will need to be cleared or graded, which may potentially result in a degree of dust being created, increased runoff and potentially soil erosion. The time that these areas are left bare will be limited to the construction phase, since vegetation will be allowed to grow back after construction. No obvious areas of erosion was identified.
XI. Installation of additional bulk telecommunication, transmission lines or facilities	☒			There is existing Eskom infrastructure in the area including power lines and a substation and the project will require the development of a power line, substation and switching stations to be constructed.
3. Is the proposed project located near the following?				
I. A river, stream, dam or wetland	☒			Two depression wetlands are located within 500m of the site, however on the opposite side of the R64 regional road.

II. A conservation or open space area	☒			The site under assessment is located within an ESA 1 and ESA 2. The project is located within 5km of a protected area in terms of NEMPAA, known as Boshof Nature Reserve located approximately 1km west of the proposed solar project as per the South Africa Protected Area Database of the Department of Forestry, Fisheries and the Environment.
III. An area that is of cultural importance		☒		None.
IV. A site of geological/palaeontological resources significance		☒		The site and general area is considered as unfossiliferous. It is assumed that the same features are located in the surrounding areas of the project.
V. An area of outstanding natural beauty		☒		None.
VI. Highly productive agricultural land		☒		None.
VII. A tourist resort	☒			A number of guest houses, lodges and hunting/game farms are located within the general area surrounding the site. present within the study area
VIII. A formal or informal settlement	☒			The town of Boshof is located approximately 2km north west of the proposed development

6.1.2 Matrix analysis

The matrix describes the relevant listed activities, the aspects of the development that will apply to the specific listed activity, a description of the environmental issues and potential impacts, the significance and magnitude of the potential impacts and possible mitigation measures. The matrix also highlights areas of particular concern (see Table 6.3) for more in-depth assessment. An indication is provided of the specialist studies which were conducted and that informed the assessment. Each cell is evaluated individually in terms of the nature of the impact, duration and its significance – should no mitigation measures be applied. This is important since many impacts would not be considered significant if proper mitigation measures were implemented.

In order to conceptualise the different impacts, the matrix specify the following:

- **Stressor**: Indicates the aspect of the proposed activity, which initiates and cause impacts on elements of the environment.
- **Receptor**: Highlights the recipient and most important components of the environment affected by the stressor.
- **Impacts**: Indicates the net result of the cause-effect between the stressor and receptor.
- **Mitigation**: Impacts need to be mitigated to minimise the effect on the environment.

Detailed impact assessments have been undertaken by each of the respective specialists which has informed the matrix analysis as included in Table 6.3, as well as the key issues identified as included in sections 6.2.1-6.2.3. The Table 6.2 includes reference to the sections in the respective specialist studies where the details of the in-depth assessment of potential environmental impacts can be obtained which informed this impact assessment of the Castor Solar PV Project.

Table 6.2: Reference to the sections in the respective specialist studies where the details of the in-depth assessment of potential environmental impacts can be obtained

Specialist Study	Impact Assessment (pg.)	Cumulative Impacts (pg.)	Mitigation Measures (pg.)
Terrestrial Ecology Impact Assessment (Appendix D1)	37-44	47-49	49-57
Avifauna Impact Assessment (Appendix D2)	34-49	59-62	62-66
Visual Impact Assessment (Appendix D3)	34-47	47-51	Same as impact assessment
Agriculture Compliance Statement (Appendix D4)	N/A - as the report is a Compliance Statement which confirms the sensitivity of the site as being of a low / very low sensitivity		
Heritage Impact Assessment (Appendix D5)	18-21	18-21	21-23
Palaeontological Impact Assessment (desktop) (Appendix D6)	N/A - due to very low sensitivity and insignificant impacts expected to occur		
Social Impact Assessment (Appendix D7)	60-90	60-90	Same as the impact assessment
Traffic Impact Assessment (Appendix D8)	24-28	28-37	Same as the impact assessment
Wetland Impact and Risk Assessment (Appendix D9)	14-19	None identified due to lack of direct impacts and wetland features associated with the development.	Same as impact assessment

Table 6.3: Matrix analysis

For ease of reference the significance of the impacts is colour-coded as follow:

Low significance	Medium significance	High significance	Positive impact

LISTED ACTIVITY (The Stressor)	ASPECTS OF THE DEVELOPMENT /ACTIVITY	POTENTIAL IMPACTS		SIGNIFICANCE AND MAGNITUDE OF POTENTIAL IMPACTS							MITIGATION OF POTENTIAL IMPACTS			SPECIALIST STUDIES / INFORMATION
		Receptors	Impact description / consequence	Minor	Major	Extent	Duration	Probability	Reversibility	Irreplaceable loss of resources	Possible Mitigation	Possible mitigation measures	Level of residual risk	
CONSTRUCTION PHASE														
Activity 11(i) (GNR 327): *"The development of facilities or infrastructure for the transmission and distribution of electricity outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts."* Activity 24 (ii) (GN.R 327): *"The development of a road (ii) with reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 meters"* Activity 28 (ii) (GN.R 327): *"Residential, mixed, retail,*	Site clearing and preparation Certain areas of the site will need to be cleared of vegetation and some areas may need to be levelled. Civil works The main civil works are: • Terrain levelling if necessary– Levelling will be minimal as the potential site chosen is relatively flat. • Laying foundation- The structures will be connected to the ground through cement pillars, cement slabs or metal screws. The exact method will	BIOPHYSICAL ENVIRONMENT	Fauna & Flora	• Destruction, loss and fragmentation of habitats, ecosystems and impacts on the vegetation community. • Introduction of Invasive Alien Plant species and invasive fauna. • Displacement of the indigenous faunal community (including Species of Conservation Concern) due to habitat loss, direct mortalities, and disturbance (road collisions, noise, dust, light, vibration, and poaching).		-	L/P	L/P	Pr/D	PR/BR	SL	Yes	• See Table 6.4	M	Terrestrial Ecology Impact Assessment (Appendix D1)
			Wetland/ Riparian areas	• Altered surface flow dynamics; • Erosion; • Alteration of sub-surface flow dynamics; • Sedimentation of the water resource; • Indirect loss of wetland areas; • Water quality impairment; • Compaction; • Decrease in vegetation; • Change of drainage patterns; and • Altering hydromorphic properties.	-		S	S	U	CR		Yes	• See Table 6.4	L	Wetland Impact and Risk Assessment (Appendix D9)

commercial, industrial or institutional developments where such land was used for agriculture or afforestation on or after 1998 and where such development (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare." <u>Activity 56 (ii) (GN.R 327):</u> *"The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre (ii) where no reserve exists, where the existing road is wider than 8 metres…"* <u>Activity 1 (GN.R 325):</u> *"The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more."* <u>Activity 15 (GN.R 325):</u> *"The clearance of an area of 20 hectares or more of indigenous vegetation."* <u>Activity 4 (b)(i)(gg) (GN.R 324):</u> *"The development of a road wider than 4 metres*	depend on the detailed geotechnical analysis and feedback from the relevant specialists. ● Construction of access and inside roads/paths – existing paths will be used were reasonably possible. Additionally, the turning circle for trucks will also be taken into consideration. <u>Transportation and installation of PV panels into an Array</u> The panels are assembled at the supplier's premises and will be transported from the factory to the site on trucks. The panels will be mounted on metal structures which are fixed into the ground either through a concrete foundation or a deep-seated screw. <u>Wiring to the Central Inverters</u> Sections of the PV array would be wired to central inverters. The inverter is a pulse width mode inverter that converts DC electricity to alternating electricity (AC) at grid frequency.		Avifauna	● Habitat destruction within the development footprint ● Destruction, degradation and fragmentation of surrounding habitats ● Displacement/emigration of the avifauna community (including SCC) due to noise pollution ● Direct mortality from persecution or poaching of avifauna species and collection of eggs ● Direct mortality from increased vehicle and heavy machinery traffic		-	S/L	L/P	Pr/ D	Br / Ir	CL	Yes	● See Table 6.4	M	Avifaunal Impact Assessment (Appendix D2)
			Air	● Air pollution due to the increase of traffic of construction vehicles and the undertaking of construction activities. ● Ecosystem damage due to pollutants and dust	-		S	S	D	CR	NL	Yes	● A speed limit should be enforced on dirt roads (preferably 30-40km/h). ● Implement standard dust control measures, including periodic spraying (frequency will depend on many factors including weather conditions, soil composition and traffic intensity and must thus be adapted on an on-going basis) of construction areas and access roads, and ensure that these are continuously monitored to ensure effective implementation.	L	-
			Existing services infrastructure	● Generation of waste that needs to be accommodated at a licensed landfill site. ● Generation of sewage that need to be accommodated by the local sewage plant. ● Increase in construction vehicles on existing roads.		-	L	S	D	PR	ML	Yes	-	L	Confirmation from the Local Municipality to provide services
			Groundwater	● Pollution due to construction vehicles and the storage and handling of dangerous goods.	-		S	S	Pr	CR	ML	Yes	● A groundwater monitoring programme (quality and groundwater levels) should be designed and installed for the site. Monitoring boreholes should be securely capped (where used), and must be fitted with a suitable sanitary seal to prevent surface	L	-

with a reserve less than 13,5 metres (b) in the Free State, (i) outside urban areas and (gg) areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve, excluding disturbed areas." <u>Activity 12 (b)(iv) (GN.R 324):</u> *"The clearance of an area of 300 square metres or more of indigenous vegetation…(b) in the Free State within (iv) areas within a watercourse or wetland; or within 100 metres from the edge of watercourse or wetland."* <u>Activity 18 (b)(i)(gg)(hh) (GN.R 324):</u> *"The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre (b) in the Free State (i) outside urban areas, within (gg) areas within 10 kilometres from national parks or*													water flowing down the outside of the casing. Full construction details of monitoring boreholes must be recorded when they are drilled (e.g. screen and casing lengths, diameters, total depth, etc). ● Sampling of monitoring boreholes should be done according to recognised standards.		
		SOCIAL/ECONOMIC ENVIRONMENT	Local unemployment rate	● Direct and indirect employment opportunities and skills development ● Economic multiplier effect		+	L/P	S	D/P	CR	NL	Yes	● See Table 6.4	L	Social Impact Assessment (Appendix D7)
			Visual landscape	● Visual impact of construction activities on sensitive visual receptors in close proximity to the proposed Castor Solar PV Project	-		L	S	D	PR	ML	Yes	● See Table 6.4	L	Visual Impact Assessment (Appendix D3)
			Traffic volumes	● Increased traffic on haulage routes ● Increased traffic on local routes ● Construction and maintenance of gravel roads in the vicinity of the site	-		L/N	S	Pr	CR	NL	Yes	● See Table 6.4	L	Traffic Impact Assessment (Appendix D8)
			Health, Safety & other social aspects	● Potential loss of productive farmland ● Impacts on safety and security. ● Impacts associated with the presence of construction workers on site and in the area. ● Influx of job seekers to the area. ● Increased safety risk to farmers, risk of stock theft and damage to farm infrastructure associated with presence of construction workers on the site. ● Impacts on daily living and movement patterns. ● Nuisance impacts (noise and dust) ● Increased risk of veld fires. ● Visual and sense of place impacts		-	L/R	S/P	Pr/ D	PR/ BR	ML/ SL	Yes	● See Table 6.4	L	Social Impact Assessment (Appendix D7)

world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve, excluding disturbed areas and (hh) Areas within a watercourse or wetland; or within 100 metres from the edge of a watercourse or wetland."			Tourism industry	• Since there are no tourism facilities in close proximity to the site, the proposed activities will not have an impact on tourism in the area.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			Heritage resources	• Direct or physical impacts, implying alteration or destruction of heritage features within the project boundaries	-		S	S	U	CR	NL	Yes	• As no sites, features or objects of cultural historic significance have been identified in the site, there would be no impact as a result of the proposed development. • Should archaeological sites or graves be exposed 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 appropriate steps to take are indicated in Section 9 of the Heritage Impact Assessment, as well as in the Management Plan: Burial Grounds and Graves, with reference to general heritage sites, in the Addendum, Section 13.5.	L	Heritage Impact Assessment (Appendix D5)
			Paleontological Heritage	• No impacts expected due to the palaeontological heritage of the area	-		S	S	U	R	NL	Yes	• See Table 6.4	L	Paleontological Impact Assessment (desktop) (Appendix D6)
OPERATIONAL PHASE															
<u>Activity 11(i) (GNR 327):</u> *"The development of facilities or infrastructure for the transmission and distribution of electricity outside urban areas or industrial complexes with a capacity of more*	The key components of the proposed project are described below: • <u>PV Panel Array</u> - To produce up to 20MW, the proposed facilities will require numerous linked cells placed behind a protective glass sheet to form a panel. Multiple panels	BIOPHYSICAL ENVIRONMENT	Fauna and Flora	• Continued fragmentation and degradation of natural habitats and ecosystems. • Continuing spread of Invasive Alien Plant and weed species. • Ongoing displacement and direct mortalities of the faunal community (including Species of Conservation Concern) due to continued disturbance (road collisions, noise, light, dust, vibration, poaching, etc.).		-	L/P	L/P	Pr/D	PR/BR	SL	Yes	• See Table 6.5	M	Terrestrial Ecology Impact Assessment (Appendix D1)

than 33 but less than 275 kilovolts." Activity 1 (GN.R 325): *"The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more."*	will be required to form the solar PV arrays which will comprise the PV facility. The PV panels will be mounted to a single access tracking frame system. ● Wiring to Central Inverters - Sections of the PV array will be wired to inverters. The inverter is a pulse width mode inverter that converts direct current (DC) electricity to alternating current (AC) electricity at grid frequency. ● Connection to the grid - Connecting the PV plant to the electrical grid requires transformation of voltage to 22kV or 66kV. The normal components and dimensions of a distribution rated electrical substation will be required. An onsite substation and switching stations will be required on the site to step the voltage up to 22kV or 66kV, after which the power will be evacuated into the national grid via a new proposed power line. It is expected that generation from the facility will tie in with		Avifauna	● Collisions with infrastructure associated with the PV Facility ● Electrocution due to infrastructure associated with the PV Facility ● Direct mortality from persecution or poaching of avifauna species and collection of eggs ● Direct mortality by roadkill during maintenance procedures ● Encroachment of Invasive Alien Plants into disturbed areas		-	S/L	L/D	Pr/ D	BR	SL	Yes	● See Table 6.5	M	Avifaunal Impact Assessment (Appendix D2)
			Air quality	● The proposed development will not result in any air pollution during the operational phase.	N/ A	N/ A	N/ A	N/ A	N/ A	N/A	N/A	N/A	N/A	N/A	N/A
			Groundwater	● Leakage of hazardous materials. The development will comprise of a distribution substation and switching station and will include transformer bays which will contain transformer oils. Leakage of these oils can contaminate water supplies.	-		L	L	Po	PR	ML	Yes	● All areas in which substances potentially hazardous to groundwater are stored, loaded, worked with or disposed of should be securely bunded (impermeable floor and sides) to prevent accidental discharge to groundwater.	L	-
			Wetland/ Riparian areas	● Altered surface flow dynamics; ● Erosion; ● Alteration of sub-surface flow dynamics; ● Sedimentation of the water resource; ● Indirect loss of wetland areas; ● Water quality impairment; ● Compaction; ● Decrease in vegetation; ● Change of drainage patterns; and ● Altering hydromorphic properties.	-		S	S	U	CR		Yes	● See Table 6.4	L	Wetland Impact and Risk Assessment (Appendix D9)
		SOCIAL/ECONOMIC	Visual landscape	● Potential visual impacts on sensitive visual receptors located within a 5km radius. ● Potential visual impacts on sensitive visual receptors in the region (5-10km). ● Lighting Impacts – lighting impacts at night on visual receptors.		-	L	L	Pr/ D	PR/ BR	ML/ SL	Yes	● See Table 6.5	L	Visual Impact Assessment (Appendix D3)

	the existing Bosplaat Rural Substation located within the affected property. The power line routes (five options for the alignment) will be assessed within a grid connection corridor of between 50 and 200m wide, which will connect the project to the existing Eskom substation compound. All four route options fall within the grid connection corridor proposed and assessed and all are considered to be technically feasible and environmentally appropriate, and therefore approval of the entire grid connection corridor is requested rather than one of the route options within the corridor. This will provide flexibility for the development from a technical perspective. ● <u>Electrical reticulation network</u> – An internal electrical reticulation network will be required and will be lain ~2-4 m			● Solar glint and glare as a visual distraction and possible air travel hazard. ● Potential visual impact of sensitive visual receptors located within a 500m radius of the proposed power line. ● Visual and sense of place impacts.											
			Traffic volumes	● Increased traffic during the operation phase	-		L	L	Pr	CR	NL	Yes	● See Table 6.5	L	Traffic Impact Assessment (Appendix D8)
			Health & Safety	● The proposed development will not result in any health and safety impacts during the operational phase.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	-	N/A	N/A
			Positive social impacts	● Direct and indirect employment opportunities and skills development opportunities ● Development of non-polluting, renewable energy infrastructure ● Contribution to Local Economic Development and social upliftment ● Potential impacts on tourism	+		L-N	L	D	PR	NL	Yes	● See Table 6.5	H-L	Social Impact Assessment (Appendix D7)
			Negative social impacts	● Potential loss of agricultural land ● Potential impacts on tourism ● Impacts associated with the loss of agricultural land. ● Visual and sense of place impacts	-		L	L	Pr	PR	SL	Yes	● See Table 6.5	L	Social Impact Assessment (Appendix D7)
			Noise levels	● The proposed development will not result in any noise pollution during the operational phase.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			Heritage resources	● Direct or physical impacts, implying alteration or destruction of heritage features within the project boundaries	-		S	S	U	CR	NL	Yes	● As no sites, features or objects of cultural historic significance have been identified in the site, there would be no impact as a result of the proposed development.	L	Heritage Impact Assessment (Appendix D5)

	underground as far as practically possible. • Supporting Infrastructure – The following auxiliary buildings with basic services including water and electricity will be required on site: ○ Roads: 6600m^2 ○ Access gate: 10m ○ O&M Building: 400m^2 ○ Laydown Area: 2000m^2 • Roads – Access will be obtained via the R64 regional road to the south of the site. An internal site road network will also be required to provide access to the solar field and associated infrastructure. • Fencing - For health, safety and security reasons, the facility will be required to be fenced off from the surrounding farm. Fencing with a height of up to 3 meters will be used.											• Should archaeological sites or graves be exposed 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 appropriate steps to take are indicated in Section 9 of the Heritage Impact Assessment, as well as in the Management Plan: Burial Grounds and Graves, with reference to general heritage sites, in the Addendum, Section 13.5.		
			Electricity supply	• Generation of additional electricity. • The power line will transport generated electricity into the grid.	+		I	L	D	I	N/A	Yes	-	N/A	-
			Electrical infrastructure	• Additional electrical infrastructure. The Castor Solar PV Project will add to the existing electrical infrastructure and aid to lessen the reliance of electricity generation from coal-fired power stations.	+		I	L	D	I	N/A	Yes	-	N/A	-

DECOMMISSIONING PHASE																
-	Dismantlement of infrastructure During the decommissioning phase the Castor Solar PV Project and its associated infrastructure will be dismantled. Rehabilitation of biophysical environment The biophysical environment will be rehabilitated.	BIOPHYSICAL ENVIRONMENT	Air quality	• Air pollution due to the increase of traffic of construction vehicles	-		S	S	D	CR	NL	Yes	• Regular maintenance of equipment to ensure reduced exhaust emissions.	L	-
			Avifauna	• Direct mortality due to earthworks, vehicle collisions and persecution • Continued habitat degradation due to Invasive Alien Plant encroachment and erosion		-	L	M/P	D	BR/IR	SL/CL	Yes	• Table 6.6	L	Avifauna Impact Assessment (Appendix D2)
			Existing services infrastructure	• Generation of waste that needs to be accommodated at a licensed landfill site • Generation of sewage that needs to be accommodated by the municipal sewerage system and the local sewage plant • Increase in construction vehicles	-		L	S	D	I	NL	Yes	-	L	Confirmation from the Local Municipality to provide services
			Groundwater	• Pollution due to construction vehicles	-		S	S	Pr	CR	ML	Yes	• All vehicles should be inspected for oil and fuel leaks on a regular basis. • Vehicle maintenance yards on site should make provision for drip trays that will be used to capture any spills. Drip trays should be emptied into a holding tank and returned to the supplier.	L	-
			Wetland/ Riparian areas	• Altered surface flow dynamics; • Erosion; • Alteration of sub-surface flow dynamics; • Sedimentation of the water resource; • Indirect loss of wetland areas; • Water quality impairment; • Compaction; • Decrease in vegetation; • Change of drainage patterns; and • Altering hydromorphic properties.	-		S	S	U	CR		Yes	• See Table 6.4	L	Wetland Impact and Risk Assessment (Appendix D9)

			Visual landscape	● Visual impact of activities on sensitive visual receptors in close proximity ● The decommissioning phase of the project will result in the same visual impacts experienced during the construction phase of the project. However, in the case of the Castor Solar PV Project the facility will be refurbished and upgraded as fa as possible. No decommissioning of the facility is proposed, however this will only be confirmed at a later stage.	-		L	S	D	PR	ML	Yes	● See Table 6.4	L	Visual Impact Assessment (Appendix D3)
			Traffic volumes	● Increased traffic during the decommissioning phase	-		L	S	Pr	CR	NL	Yes	● See Table 6.6	L	Traffic Impact Assessment (Appendix D8)
			Health & Safety	● Air/dust pollution. ● Road safety. ● Increased crime levels. The presence of construction workers on the site may increase security risks associated with an increase in crime levels as a result of influx of people in the rural area.	-		L	S	Pr	PR	ML	Yes	● Demarcated routes to be established for construction vehicles to ensure the safety of communities, especially in terms of road safety and communities to be informed of these demarcated routes. ● Where dust is generated by trucks passing on gravel roads, dust mitigation must be enforced. ● Any infrastructure that would not be decommissioned must be appropriately locked and/or fenced off to ensure that it does not pose any danger to the community. ● Components that are dismantled must be recycled / reduced as far as possible.	L	-
			Noise levels	● The generation of noise as a result of construction vehicles, the use of machinery and people working on the site	-		L	S	D	CR	NL	Yes	● The decommissioning phase must aim to adhere to the relevant noise regulations and as far as possible noise to be limited within standard working hours in order to reduce	L	-

												disturbance of dwellings in close proximity to the development.		
			Tourism industry	• Since there are no tourism facilities in close proximity to the site, the decommissioning activities will not have an impact on tourism in the area.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			Heritage resources	• Direct or physical impacts, implying alteration or destruction of heritage features within the project boundaries	-		S	S	U	CR	NL	Yes	• As no sites, features or objects of cultural historic significance have been identified in the site, there would be no impact as a result of the proposed development. • Should archaeological sites or graves be exposed 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 appropriate steps to take are indicated in Section 9 of the Heritage Impact Assessment, as well as in the Management Plan: Burial Grounds and Graves, with reference to general heritage sites, in the Addendum, Section 13.5.	L	Heritage Impact Assessment (Appendix D5)

Nature of the impact:	(N/A) No impact	(+) Positive Impact	(-) Negative Impact	
Geographical extent:	(S) Site;	(L) Local/District;	(P) Province/Region;	(I) International and National
Probability:	(U) Unlikely;	(Po) Possible;	(Pr) Probable;	(D) Definite
Duration:	(S) Short Term;	(M) Medium Term;	(L) Long Term;	(P) Permanent
Intensity / Magnitude:	(L) Low;	(M) Medium;	(H) High;	(VH) Very High
Reversibility:	(CR) Completely Reversible;	(PR) Partly Reversible;	(BR) Barely Reversible;	-
Irreplaceable loss of resources:	(IR) Irreversible	(NL) No Loss;	(ML) Marginal Loss;	(SL) Significant Loss;	(CL) Complete Loss
Level of residual risk:	(L) Low;	(M) Medium;	(H) High;	(VH) Very High	-

The recommended mitigation measures are included in the Environmental Management Programme for the project. The EMPr for the Castor Solar PV Project is included in Appendix E1. The EMPr for the power line is included in Appendix E2 and the EMPr for the substation is included in Appendix E3. An Alien Invasive Plant Species Management and Rehabilitation Plan is included as Appendix E4.

An Environmental Awareness and Fire Management Plan is included in Appendix I of the EMPr in Appendix E1.

6.2 KEY ISSUES IDENTIFIED

From the above it is evident that mitigation measures should be available for potential impacts associated with the proposed activity and development phases. The scoping methodology identified the following key issues which were addressed in more detail in the BA report.

6.2.1 Impacts during the construction phase

During the construction phase the following activities will have various potential impacts on the biophysical and socio-economic environment:

- Activity 11(i) (GNR 327): *"The development of facilities or infrastructure for the transmission and distribution of electricity outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts."*
- Activity 24 (ii) (GN.R 327): *"The development of a road (ii) with reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 meters"*
- Activity 28 (ii) (GN.R 327): *"Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture or afforestation on or after 1998 and where such development (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare."*
- Activity 56 (ii) (GN.R 327): *"The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre (ii) where no reserve exists, where the existing road is wider than 8 metres…"*
- Activity 1 (GN.R 325): *"The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more."*
- Activity 15 (GN.R 325): *"The clearance of an area of 20 hectares or more of indigenous vegetation."*
- Activity 4 (b)(i)(gg) (GN.R 324): *"The development of a road wider than 4 metres with a reserve less than 13,5 metres (b) in the Free State, (i) outside urban areas and (gg) areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve, excluding disturbed areas."*
- Activity 12 (b)(iv) (GN.R 324): *"The clearance of an area of 300 square metres or more of indigenous vegetation…(b) in the Free State within (iv) areas within a watercourse or wetland; or within 100 metres from the edge of watercourse or wetland."*
- Activity 18 (b)(i)(gg)(hh) (GN.R 324): *"The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre (b) in the Free State (i) outside urban areas, within (gg) areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve, excluding disturbed areas and (hh) Areas within a watercourse or wetland; or within 100 metres from the edge of a watercourse or wetland."*

During the construction phase negative impacts are foreseen over the short term, and in some cases the impacts will be temporary. Table 6.4 summarises the potentially most significant impacts and the mitigation measures that are proposed during the construction phase.

Table 6.4: Impacts and the mitigation measures during the construction phase

SPECIALIST STUDY	IMPACT / OUTCOME	PRE-MITIGATION RATING	POST MITIGATION RATING	SUMMARY OF MITIGATION MEASURES
Terrestrial Ecology Impact Assessment (Appendix D1)	Impacts to vegetation and habitats	Negative High	Negative Low	● All high sensitivity areas should be avoided, and these areas should be clearly demarcated by non-hazardous/dangerous fencing. Brush cutting to be implemented beneath the panels, no vegetation clearing is permitted. ● Laydown and construction preparation activities (such as cement mixing, temporary toilets, etc.) must be limited to the 'Very Low' sensitivity areas. ● The clearing of vegetation must be minimized where possible. All activities must be restricted to within the authorised areas. It is recommended that areas to be developed be specifically and responsibly demarcated so that during the construction phase only the demarcated areas be impacted upon. ● All protected flora must be clearly demarcated prior to the commencement of site clearing. If construction activities are likely to affect any protected plants, these individuals should be relocated as part of a plant search and rescue plan. ● Existing access routes, especially roads, must be made use of. ● Materials may not be stored for extended periods of time and must be removed from the site once the construction phase has been concluded. No permanent construction phase structures should be permitted. Construction buildings should preferably be prefabricated or constructed of re-usable/recyclable materials. No storage of vehicles or equipment will be allowed outside of the designated laydown areas. ● A hydrocarbon 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 must 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 must 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 from leaking and entering the environment. ○ Construction activities and vehicles could cause spillages of lubricants, fuels and waste material negatively affecting the functioning of the ecosystem. ○ All vehicles and equipment must be maintained, and all re-fuelling and servicing of equipment is to take place in demarcated areas outside of the project area. ● It must 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 must be brought into/taken from the project area, to prevent the spread of exotic or invasive species or the illegal collection of plants. ● A fire management plan must be complied and implemented to restrict the impact fire would have on the surrounding areas. ● All construction waste must be removed from site at the closure of the construction phase.

	Impacts to fauna	Negative High	Negative Medium	• A qualified environmental control officer must be on site when activities begin. A site walk through is recommended by a suitably qualified ecologist prior to any activities taking place and any SSC or protected species must be noted. In situations where these species are observed these must be removed, the proponent may only do so after the required permission/permits have been obtained in accordance with national and provincial legislation. In the abovementioned situation the development and implementation of a search, rescue and recovery program is suggested for the protection of these species. Should animals not move out of the area on their own the relevant specialists must be contacted to advise on how the species can be relocated. • Clearing and disturbance activities must be conducted in a progressive linear manner, from the south to the north of the site and over several days, so as to provide an easy escape route for all small mammals and herpetofauna. • The areas to be disturbed must be specifically and responsibly demarcated to prevent the movement of staff or any individual into the surrounding environments, signs must be put up to enforce this. • The duration of the activities must be minimized to as short a term as possible, to reduce the period of disturbance on fauna. • As far as possible, noise must be kept to an absolute minimum during the evenings and at night to minimize all possible disturbances to reptile species and nocturnal mammals. • No trapping, killing, or poisoning of any wildlife is to be allowed and signs must be put up to enforce this. Monitoring must take place in this regard. • Outside lighting must be designed and limited to minimize impacts on fauna. All outside lighting must be directed away from highly sensitive areas.

				Fluorescent and mercury vapor lighting must be avoided, and sodium vapor (green/red) lights must be used wherever possible. ● All construction and maintenance motor vehicle operators must undergo an environmental induction that includes instruction on the need to comply with speed limits, to respect all forms of wildlife. Speed limits must be enforced to ensure that road killings and erosion is limited. ● As far as possible, schedule activities and operations during least sensitive periods, to avoid migration, nesting, and breeding seasons. ● Any holes/deep excavations must be dug and planted in a progressive manner and must not be left open overnight. Should any holes remain open overnight they must be properly covered temporarily to ensure that no small fauna species fall in, and subsequently inspected prior to backfilling. ● Fencing mitigations: ○ Top 2 strands must be smooth wire ○ Routinely retention loose wires ○ Minimum 30cm between wires ○ Place markers on fences. ● Wildlife-permeable fencing with holes large enough for mongoose and other smaller mammals must be installed, 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. ● Use environmentally friendly cleaning and dust suppressant products. ● Once the development layout has been confirmed, the footprint area must be fenced off appropriately in segments during pre-construction to allow animals to move or be moved out of these areas before breaking ground activities occur. Construction activities must take place systemically and the

				perimeter fence must not be completed (i.e., leaving sections unfenced to allow fauna to escape) until systematic clearing is completed. Drilling etc. must start on one side of the site and progress towards the section of the site where fences are incomplete (ideally south to north).
	Invasion of Alien Species	Negative Medium	Negative Low	• An Invasive Alien Plant (IAP) Management Plan must be compiled and implemented. This must be regularly updated to reflect the annual changed in IAP composition. • The footprint area of the construction site must be kept to a minimum. The footprint area must be clearly demarcated to avoid unnecessary disturbances to adjacent areas. Footprints of the roads must be kept to prescribed widths. • Waste management must be a priority and all waste must be collected and stored adequately. It is recommended that all waste be removed from site on a weekly basis to prevent rodents and pests entering the site. A location specific waste management plan must be put in place to limit the presence of rodents and pests and waste must not be allowed to enter surrounding areas. • A pest control plan must be put in place and implemented; it is imperative that poisons not be used to control pests due to the presence of Species of Conservation Concern.
	Dust Impacts	Negative High	Negative Medium	• Dust-reducing mitigation measures must be put in place and must be strictly adhered to. This includes the wetting of exposed soft soil surfaces. • No non-environmentally friendly suppressants must be used as this could result in the pollution of water sources.

	Waste management	Negative High	Negative Medium	• Waste management must be a priority and all waste must be collected and stored effectively and responsibly according to a site-specific waste management plan. Dangerous waste such as metal wires and glass must only be stored in fully sealed and secure containers, before being moved off site as soon as possible. • Litter, spills, fuels, chemical and human waste in and around the project area must be minimised and controlled according to the waste management plan. • Cement mixing must not be performed on the ground. It is recommended that only closed side drum or pan type concrete mixers be utilised. Any spills must be immediately contained and isolated from the natural environment, before being removed from site • 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. • The Contractor must supply sealable and properly marked domestic waste collection bins and all solid waste collected must be disposed of at a licensed disposal facility within every 10 days at least. • Where a registered disposal facility is not available close to the project area, the Contractor must provide a method statement with regards to waste management. Under no circumstances may domestic waste be burned on site or buried on open pits. • Refuse bins must be responsibly emptied and secured. Temporary storage of domestic waste must be in covered and secured waste skips. Maximum domestic waste storage period will be 10 days.
	Environmental Awareness Training	Negative High	Negative Low	• All personnel and contractors are to undergo Environmental Awareness Training. A signed register of attendance must be kept for proof.

				• Discussions are required on sensitive environmental receptors within the site to inform contractors and site staff of the presence of sensitive fauna species, their identification, conservation status and importance, biology, habitat requirements and management requirements in line with the Environmental Authorisation and within the EMPr. • Contractors and employees must all undergo the induction and must be made aware of the rocky areas to be avoided.
	Erosion	Negative High	Negative Low	• Speed limits must be put in place to reduce erosion. Soil surfaces must be wetted as necessary to reduce the dust generated by the project activities. Speed bumps and signs must be erected to enforce slow speeds. • Only existing access routes and walking paths must be made use of. • Areas that are denuded during construction must be re-vegetated with indigenous vegetation to prevent erosion during flood events etc. • A stormwater management plan must be compiled and implemented.
Wetland Impact and Risk Assessment (Appendix D9)	Indirect impacts to wetlands located outside of the site	Negative Low	Negative Low	• The wetlands and buffer areas must be avoided; • A stormwater management plan must be compiled and implemented for the project, facilitating the diversion of clean water to the delineated resources; • The construction vehicles and machinery must make use of existing access routes as much as possible, before adjacent areas are considered for access; • Laydown yards, camps and storage areas must be within project area; • The contractors used for the project must have spill kits available to ensure that any fuel or oil spills are clean-up and discarded correctly; • It is preferable that construction takes place during the dry season to reduce the erosion potential of the exposed surfaces; • All chemicals and toxicants to be used for the construction must be stored within the construction site and in a bunded area;

				• All machinery and equipment must be inspected regularly for faults and possible leaks, these should be serviced off-site; • All contractors and employees must undergo induction which is to include a component of environmental awareness. The induction is to include aspects such as the need to avoid littering, the reporting and cleaning of spills and leaks and general good "housekeeping"; • Adequate sanitary facilities and ablutions on the servitude must be provided for all personnel throughout the project area. Use of these facilities must be enforced (these facilities must be kept clean so that they are a desired alternative to the surrounding vegetation); • Have action plans on site, and training for contractors and employees in the event of spills, leaks and other impacts to the aquatic systems; • Any exposed earth must be rehabilitated promptly by planting suitable vegetation (vigorous indigenous grasses) to protect the exposed soil; • No dumping of material on-site may take place; and • All waste generated on-site during construction must be adequately managed. Separation and recycling of different waste materials must be supported.
Avifauna Impact Assessment (Appendix D2)	Habitat destruction within the development footprint	Negative High	Negative Medium	• Solar panels must be mounted on pile driven or screw foundations, such as post support spikes, rather than heavy foundations, such as trench-fill or mass concrete foundations, to reduce the negative effects on natural soil functioning, such as its filtering and buffering characteristics, while maintaining habitats for both fossorial and epigeic biodiversity (Bennun et al, 2021). If concrete foundations are used it would increase the impact of the project as there would be direct impacts to soil permeability and characteristics, thereby influencing inhabitant fauna. In addition,

				stormwater runoff and runoff from cleaning the panels would be increased, increasing erosion in the surrounding areas. ● Indigenous vegetation to be maintained under the solar panels to ensure biodiversity is maintained and to prevent soil erosion (Beatty et al, 2017; Sinha et al, 2018). ● Vegetation clearing to commence only after the necessary permits have been obtained. ● Environmental Officer (EO) to provide supervision and oversight of vegetation clearing activities.
	Destruction, degradation and fragmentation of surrounding habitats	Negative Very High	Negative Low	● Pre-construction environmental induction for all construction staff on site must be undertaken to ensure that basic environmental principles are adhered to. This includes awareness of no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, remaining within demarcated construction areas etc. ● All solid waste must be managed in accordance with the Solid Waste Management Plan (to be drafted prior to construction, as per the solid waste requirements of the facility). Recycling is encouraged. ● All construction activity and roads to be within the clearly defined and demarcated areas. ● Temporary laydown areas should be clearly demarcated and rehabilitated subsequent to end of use. ● Appropriate dust control measures must be implemented. ● Suitable sanitary facilities to be provided for construction staff as per the guidelines in Health and Safety Act.

				• All hazardous materials, if any, should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site must be cleaned up in the appropriate manner.
	Displacement/ emigration of the avifauna community (including SCC) due to noise pollution	Negative High	Negative Low	• Noise pollution is difficult to mitigate against. • As far as possible, no construction activity is to occur at night, as nocturnal species are highly dependent on sound and/or vocalisations for behavioural processes. • If generators are to be used these must be soundproofed.
	Direct mortality from persecution or poaching of avifauna species and collection of eggs	Negative Medium	Negative Low	• All personnel should undergo environmental awareness training that includes educating on not poaching/persecuting species and collecting eggs. • Prior to commencing each work day, two individuals should traverse the working area in order to disturb any avifauna and so they have a chance to vacate the area. • Any avifauna threatened by the construction activities that does not vacate the area must be removed safely by an appropriately qualified environmental officer or removal specialist.
	Direct mortality from increased vehicle and heavy machinery traffic	Negative Medium	Negative Low	• All personnel must undergo environmental induction with regards to awareness about speed limits and roadkill. • All construction vehicles must adhere to a speed limit of maximum 40 km/h to avoid collisions. Appropriate speed control measures and signs must be erected.
Heritage Impact Assessment (Appendix D5)	Direct or physical impacts, implying alteration or	Negative Low	Negative Low	• Known sites (where discovered) must be clearly marked, so that they can be avoided during construction activities. • The contractors and workers must be notified that archaeological sites might be exposed during the construction activities.

	destruction of heritage features			• Should any heritage artefacts be exposed during excavation, work on the area where the artefacts were discovered, must cease immediately and the Environmental Control Officer (ECO) shall be notified as soon as possible. • All discoveries must be reported immediately to a heritage practitioner so that an investigation and evaluation of the finds can be made. Acting upon advice from these specialists, the ECO must advise the necessary actions to be taken. • Under no circumstances must any artefacts be removed, destroyed or interfered with by anyone on the site. • Contractors and workers must be advised of the penalties associated with the unlawful removal of cultural, historical, archaeological or palaeontological artefacts, as set out in the NHRA, Section 51(1). • A person or entity, e.g. the ECO, must be tasked to take responsibility for the maintenance heritage sites (where present). • In areas where the vegetation is threatening the heritage sites, e.g. growing trees pushing walls over, it must be removed, but only after permission for the methods proposed has been granted by SAHRA. A heritage official must be part of the team executing these measures.
Palaeontological Impact Assessment (desktop) (Appendix D6)	Destroy or permanently seal-in fossils at or below the surface that are then no longer available for scientific study	Negative Low	Negative Low	• Any substantial fossil remains (e.g. plant remains, vertebrate bones, teeth) encountered during excavation should be reported to SAHRA for possible mitigation by a professional palaeontologist at the developers expense.

	No impacts expected due to the palaeontological heritage of the area			
Visual Impact Assessment (Appendix D3)	Visual impact of construction activities on sensitive visual receptors in close proximity to the proposed project	Negative Low	Negative Low	Planning ● Retain and maintain natural vegetation immediately adjacent to the development footprint. Construction ● Ensure that vegetation is not unnecessarily removed during the construction phase. ● Plan the placement of laydown areas and temporary construction equipment camps in order to minimise vegetation clearing (i.e., in already disturbed areas) where possible. ● Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads. ● Ensure that rubble, litter, etc. are appropriately stored (if it can't be removed daily) and then disposed of regularly at a licenced waste site. ● Reduce and control dust during construction by utilising dust suppression measures. ● Limit construction activities between 07:00 and 18:00, where possible, in order to reduce the impacts of construction lighting. ● Rehabilitate all disturbed areas immediately after the completion of construction work and maintain good housekeeping.
Social Impact Assessment	Direct and indirect employment	Positive Low	Positive Low	Enhancement: ● A local employment policy should be adopted to maximise opportunities made available to the local labour force.

(Appendix D7)	opportunities and skills development			● Labour should be sourced from the local labour pool, and only if the necessary skills are unavailable should labour be sourced from (in order of preference) the greater Tokologo LM, Lejweleputswa DM, Free State Province, South Africa, or elsewhere. ● Where feasible, training and skills development programmes should be initiated prior to the commencement of the construction phase. ● As with the labour force, suppliers should also as far as possible be sourced locally. ● As far as possible local contractors that are compliant with Broad-Based Black Economic Empowerment (B-BBEE) criteria should be used. ● The recruitment selection process should seek to promote gender equality and the employment of women wherever possible.
	Economic Multiplier effect	Positive Low	Positive Low	Enhancement: ● It is recommended that a local procurement policy is adopted to maximise the benefit to the local economy. ● A database of local companies, specifically Historically Disadvantaged Individuals (HDIs) which qualify as potential service providers (e.g., construction companies, security companies, catering companies, waste collection companies, transportation companies etc.) should be created and companies listed thereon should be invited to bid for project-related work where applicable. ● Local procurement is encouraged along with engagement with local authorities and business organisations to investigate the possibility of procurement of construction materials, goods and products from local suppliers where feasible.

	Potential loss of productive farmland	Negative Low	Negative Low	● The proposed site needs to be fenced off prior to the construction phase and all construction related activities should be confined in this fenced off area. ● Game/livestock grazing on the proposed site needs to be relocated. ● All affected areas, which are disturbed during the construction phase, need to be rehabilitated prior to the operational phase and should be continuously monitored by the Environmental Control Officer (ECO). ● Implement, manage and monitor a grievance mechanism for the recording and management of social issues and complaints. ● Mitigation measures from the Agricultural Compliance Statement (if any), must be implemented.
	Influx of jobseekers and change in population	Negative Medium	Negative Low	● Develop and implement a local procurement policy which prioritises "locals first" to prevent the movement of people into the area in search of work. ● Engage with local community representatives prior to construction to facilitate the adoption of the locals first procurement policy. ● Provide transportation for workers (from closest towns and surrounds) to ensure workers can easily access their place of employment and do not need to move closer to the project site. ● As far as possible, working hours should be kept between daylight hours during the construction phase, and / or as any deviation that is approved by the relevant authorities. ● Compile and implement a grievance mechanism. ● Appoint a Community Liaison Officer (CLO) to assist with the procurement of local labour. ● Prevent the recruitment of workers at the project site. ● Implement, manage and monitor a grievance mechanism for the recording and management of social issues and complaints.

				• Establish clear rules and regulations for access to the proposed site. • Appoint a security company and implement appropriate security procedures to ensure that workers do not remain onsite after working hours. • Inform local community organisations and policing forums of construction times and the duration of the construction phase. • Establish procedures for the control and removal of loiterers from the construction site.
	Safety and security impacts	Negative Medium	Negative Low	• As far as possible, working hours should be kept within daylight hours during the construction phase, and / or as any deviation that is approved by the relevant authorities. • Provide transportation for workers to prevent loitering within or near the project site outside of working hours. • The perimeter of the construction site should be appropriately secured to prevent any unauthorised access to the site. The fencing of the site should be maintained throughout the construction period. • The appointed EPC Contractor must appoint a security company to ensure appropriate security procedures and measures are implemented. • Access in and out of the construction site should be strictly controlled by a security company appointed to the project. • A CLO should be appointed as a grievance mechanism. A method of communication should be implemented whereby procedures to lodge complaints are set out for the local community to express any complaints or grievances with the construction process. • The EPC Contractor should implement a stakeholder management plan to address neighbouring farmer concerns regarding safety and security.

				• The project proposed must prepare and implement a Fire Management Plan; this must be done in conjunction with surrounding landowners. • The EPC Contractor must prepare a Method Statement which deals with fire prevention and management.
	Impacts on daily living and movement patterns	Negative Low	Negative Low	• All vehicles must be road worthy, and drivers must be qualified, obey traffic rules, follow speed limits and be made aware of the potential road safety issues. • Heavy vehicles should be inspected regularly to ensure their road worthiness. • Provision of adequate and strategically placed traffic warning signs, that have to be maintained for the duration of the construction phase, and control measures along the R64 to warn road users of the construction activities taking place for the duration of the construction phase. Warning signs must be always visible, especially at night. • Implement penalties for reckless driving to enforce compliance to traffic rules. • Avoid heavy vehicle activity during "peak" hours (when children are taken to school, or people are driving to work). • The developer and EPC Contractor must ensure that all fencing along access roads is maintained in the present condition or repaired if disturbed due to construction activities. • The developer and EPC Contractor must ensure that the roads utilised for construction activities are either maintained in the present condition or upgraded if disturbed due to construction activities.

				• The EPC Contractor must ensure that damage / wear and tear caused by construction related traffic to the access roads is repaired before the completion of the construction phase. • A method of communication must be implemented whereby procedures to lodge complaints are set out for the local community to express any complaints or grievances with the construction process.
	Nuisance impacts (noise and dust)	Negative Low	Negative Low	• The movement of heavy vehicles associated with the construction phase should be timed to avoid weekends, public holidays, and holiday periods where feasible. • Dust suppression measures must be implemented for heavy vehicles such as wetting of gravel roads on a regular basis and ensuring that vehicles used to transport sand and building materials are fitted with tarpaulins or covers. • Ensure all vehicles are road worthy, drivers are qualified and are made aware of the potential noise and dust issues. • A CLO should be appointed, and a grievance mechanism implemented.
	Increased risk of potential veld fires	Negative Medium	Negative Low	• A firebreak should be implemented before the construction phase. The firebreak should be controlled and implemented around the perimeters of the project site. • Adequate fire-fighting equipment should be provided and readily available on site and all staff should be trained in firefighting and how to use the fire-fighting equipment. • No staff (except security) should be accommodated overnight on site and the contractor should ensure that no open fires are allowed on site. The use of cooking or heating implements should only be used in designated areas.

				• Contractors need to ensure that any construction related activities that might pose potential fire risks, are done in the designated areas where it is also managed properly. • Precautionary measures need to be taken during high wind conditions or during the winter months when the fields are dry. • The contractor should enter an agreement with the local farmers before the construction phase that any damages or losses during the construction phase related to the risk of fire and that are created by staff during the construction phase, are borne by the contractor.
	Visual and sense of place impacts	Negative Medium	Negative Low	• Implement mitigation measures identified in the Visual Impact Assessment (VIA) prepared for the project. • As far as possible, limit noise generating activities to normal daylight working hours and avoid weekends and public holidays. • The movement of heavy vehicles associated with the construction phase should be timed to avoid weekends, public holidays, and holiday periods where feasible. • Dust suppression measures must be implemented for heavy vehicles such as wetting of gravel roads on a regular basis and ensuring that vehicles used to transport sand and building materials are fitted with tarpaulins or covers. • All vehicles must be road-worthy, and drivers must be qualified and made aware of the potential road safety issues and need for strict speed limits. • Communication, complaints, and grievance channels must be implemented and contact details of the CLO must be provided to the local community in the study area.

Traffic Impact Assessment (Appendix D8)	Increased traffic on haulage and local routes and construction and maintenance of gravel roads in the vicinity of the site	Negative Low	Negative Low	• The impact of the increased traffic on regional and local routes can be mitigated by staggering trips and scheduling so that peak hour traffic in local towns is not impacted by construction traffic. • Maintenance to lower order roads can be incorporated into the schedule, especially the maintenance of the road accessing the site. The site access road would require construction at the start of the construction project, in order to safely transport the sensitive cargo through the site. A gravel roads maintenance programme for the gravel roads on site is recommended.

6.2.2 Impacts during the operational phase

During the operational phase the site will serve as a solar plant. The potential impacts will take place over a period of 20 – 25 years. During the operational phase the following activities will have various potential impacts on the biophysical and socio-economic environment:

- Activity 11(i) (GNR 327): *"The development of facilities or infrastructure for the transmission and distribution of electricity outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts."*
- Activity 1 (GN.R 325): *"The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more."*

Table 6.5 summarised the negative impacts are generally associated with the Castor Solar PV Project (including other associated infrastructure) and power line, which include impacts on the fauna and flora, soils, surface water, the pressure on existing services infrastructure, and visual impacts. The provision of sustainable services delivery also needs to be confirmed by the Applicant. The operational phase will have a direct positive impact through the provision of employment opportunities for its duration, and the generation of either direct or indirect income to the local community.

Table 6.5: Impacts and the mitigation measures during the operational phase

SPECIALIST STUDY	IMPACT/OUTCOME	PRE-MITIGATION RATING	POST MITIGATION RATING	SUMMARY OF MITIGATION MEASURES
Terrestrial Ecology Impact Assessment (Appendix D1)	Impacts to vegetation and habitats	Negative High	Negative Low	• The clearing of vegetation must be minimized where possible. All activities must be restricted to within the authorised areas. It is recommended that areas to be developed be specifically and responsibly demarcated. • Existing access routes, especially roads, must be made use of. • Materials may not be stored for extended periods of time and must be removed from the site once the construction phase has been concluded. No permanent construction phase structures should be permitted. Construction buildings should preferably be prefabricated or constructed of re-usable/recyclable materials. No storage of vehicles or equipment will be allowed outside of the designated laydown areas. • Areas that are denuded during construction need to be re-vegetated with indigenous vegetation according to a habitat rehabilitation plan, to prevent erosion during flood and wind events and to promote the regeneration of functional habitat. This will also reduce the likelihood of encroachment by invasive alien plant species. All grazing mammals must be kept out of the areas that have recently been re-planted. • A hydrocarbon 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 must 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 must 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 from leaking and entering the environment. ○ Construction activities and vehicles could cause spillages of lubricants, fuels and waste material negatively affecting the functioning of the ecosystem. ○ All vehicles and equipment must be maintained, and all re-fuelling and servicing of equipment is to take place in demarcated areas outside of the project area. ● It must 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 must be brought into/taken from the project area, to prevent the spread of exotic or invasive species or the illegal collection of plants. ● A fire management plan must be complied and implemented to restrict the impact fire would have on the surrounding areas.

	Impacts to fauna	Negative High	Negative Low	• The areas to be disturbed must be specifically and responsibly demarcated to prevent the movement of staff or any individual into the surrounding environments, signs must be put up to enforce this.
				• Noise must be kept to an absolute minimum during the evenings and at night to minimize all possible disturbances to reptile species and nocturnal mammals.
				• No trapping, killing, or poisoning of any wildlife is to be allowed and signs must be put up to enforce this. Monitoring must take place in this regard.
				• Outside lighting must be designed and limited to minimize impacts on fauna. All outside lighting must be directed away from highly sensitive areas. Fluorescent and mercury vapor lighting must be avoided, and sodium vapor (green/red) lights must be used wherever possible.
				• All construction and maintenance motor vehicle operators must undergo an environmental induction that includes instruction on the need to comply with speed limits, to respect all forms of wildlife. Speed limits must be enforced to ensure that road killings and erosion is limited.
				• Schedule activities and operations during least sensitive periods, to avoid migration, nesting, and breeding seasons.
				• Fencing mitigations:
				  ○ Top 2 strands must be smooth wire
				  ○ Routinely retention loose wires
				  ○ Minimum 30cm between wires
				  ○ Place markers on fences.

				• Use environmentally friendly cleaning and dust suppressant products.
	Establishment of Alien Invasive Plants	Negative High	Negative Low	• An Invasive Alien Plant Management Plan must be compiled and implemented. This must be regularly updated to reflect the annual changed in IAP composition. • The footprint area of the construction site must be kept to a minimum. The footprint area must be clearly demarcated to avoid unnecessary disturbances to adjacent areas. Footprints of the roads must be kept to prescribed widths. • Waste management must be a priority and all waste must be collected and stored adequately. It is recommended that all waste be removed from site on a weekly basis to prevent rodents and pests entering the site. A location specific waste management plan must be put in place to limit the presence of rodents and pests and waste must not be allowed to enter surrounding areas. • A pest control plan must be put in place and implemented; it is imperative that poisons not be used to control pests due to the presence of SCC.
	Waste management	Negative High	Negative Low	• Waste management must be a priority and all waste must be collected and stored effectively and responsibly according to a site-specific waste management plan. Dangerous waste such as metal wires and glass must only be stored in fully sealed and secure containers, before being moved off site as soon as possible. • Litter, spills, fuels, chemical and human waste in and around the project area must be minimised and controlled according to the waste management plan.

				• 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. • The Contractor must supply sealable and properly marked domestic waste collection bins and all solid waste collected must be disposed of at a licensed disposal facility within every 10 days at least. • Where a registered disposal facility is not available close to the project area, the Contractor must provide a method statement with regards to waste management. Under no circumstances may domestic waste be burned on site or buried on open pits. • Refuse bins must be responsibly emptied and secured. Temporary storage of domestic waste must be in covered and secured waste skips. Maximum domestic waste storage period will be 10 days.
	Erosion	Negative High	Negative Low	• Speed limits must be put in place to reduce erosion. Soil surfaces must be wetted as necessary to reduce the dust generated by the project activities. Speed bumps and signs must be erected to enforce slow speeds. • Only existing access routes and walking paths must be made use of. • Areas that are denuded during construction must be re-vegetated with indigenous vegetation to prevent erosion during flood events etc. • A stormwater management plan must be compiled and implemented.

Avifauna Impact Assessment (Appendix D2)	Collisions with infrastructure associated with the PV Facility	Negative High	Negative Medium	• The design of the proposed solar plant must be of a type or similar structure as endorsed by the Eskom-Endangered Wildlife Trust (EWT) Strategic Partnership on Birds and Energy, considering the mitigation guidelines recommended by Birdlife South Africa. • Infrastructure should be consolidated where possible in order to minimise the amount of ground and air space used. This would involve using existing/approved pylons and associated infrastructure for different lines. • Non-polarising white tape can be used around and/or across panels to minimise reflection (Bennun et al, 2021). This is especially pertinent to waders and aquatic species that may recognise the panel array as water bodies (lake effect as described above) and collide with the panels, causing mortality. • Overhead cables/lines must be fitted with industry standard bird flight diverters in order to make the lines as visible as possible to collision-susceptible species. Shaw et al (2021) demonstrated that large avifauna species mortality was reduced by 51% (95% CI: 23–68%). Recommended bird diverters such as flapping devices (dynamic device) and thickened wire spirals (static device) that increase the visibility of the lines should be fitted 5 m apart. The Inotec BFD88 bird diverter is highly recommended due to its visibility under low light conditions when most species move from roosting to feeding sites.

				• Fencing mitigations:
				  ○ Top 2 strands must be smooth wire;
				  ○ Routinely retention loose wires;
				  ○ Minimum distance between wires is 300 mm; and
				  ○ Place markers on fences.

	Electrocution due to infrastructure associated with the PV Facility	Negative High	Negative Low	• The design of the proposed solar plant and grid lines 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. • Insulation where energised parts and/or grounded parts are covered with materials appropriate for providing incidental contact protection to birds. It is best to use suspended insulators and vertical disconnectors, if upright insulators or horizontal disconnectors are present, these should be covered. • Perch discouragers can be used such as perch guards or spikes. Considerable success can be achieved by providing artificial bird safe perches, which are placed at a safe distance from the energised parts (Prinsen et al, 2012).
	Direct mortality from persecution or poaching of avifauna species and collection of eggs	Negative Medium	Negative Low	• All personnel must undergo environmental awareness training that includes educating on not poaching/persecuting avifauna species and collecting eggs.
	Direct mortality by roadkill during maintenance procedures	Negative Medium	Negative Low	• All personnel must undergo environmental induction with regards to awareness about speed limits and roadkill.

				• All vehicles must adhere to a speed limit of maximum 40 km/h to avoid collisions. Appropriate speed control measures and signs must be erected.
	Encroachment of Invasive Alien Plants (IAP) into disturbed areas	Negative Very High	Negative Low	• An IAP Management Plan must be written and implemented for the development. The developer must contract a specialist to develop the plan and the developer is responsible for its implementation. • Regular monitoring for IAP encroachment during the operation phase must be undertaken to ensure that no alien invasion problems have developed as result of the disturbance. This should be every 3 months during the first two years of the operation phase and every six months for the life of the project. • All IAP species must be removed/controlled using the appropriate techniques as indicated in the IAP management plan.
Heritage Impact Assessment (Appendix D5)	Direct or physical impacts, implying alteration or destruction of heritage features	Negative Low	Negative Low	• Known sites (where discovered) must be clearly marked, so that they can be avoided during construction activities. • The contractors and workers must be notified that archaeological sites might be exposed during the construction activities. • Should any heritage artefacts be exposed during excavation, work on the area where the artefacts were discovered, must cease immediately and the Environmental Control Officer (ECO) shall be notified as soon as possible.

				• All discoveries must be reported immediately to a heritage practitioner so that an investigation and evaluation of the finds can be made. Acting upon advice from these specialists, the ECO must advise the necessary actions to be taken. • Under no circumstances must any artefacts be removed, destroyed or interfered with by anyone on the site. • Contractors and workers must be advised of the penalties associated with the unlawful removal of cultural, historical, archaeological or palaeontological artefacts, as set out in the NHRA, Section 51(1). • A person or entity, e.g. the ECO, must be tasked to take responsibility for the maintenance heritage sites (where present). • In areas where the vegetation is threatening the heritage sites, e.g. growing trees pushing walls over, it must be removed, but only after permission for the methods proposed has been granted by SAHRA. A heritage official must be part of the team executing these measures.
Visual Impact Assessment (Appendix D3)	Visual impact on sensitive visual receptors located within 5km of the project	Negative Medium	Negative Low	Planning • Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint. • Where insufficient natural vegetation exists next to the property, a 'screen' can be planted using endemic, fast growers that are water efficient. Operations • Maintain general appearance of the facility as a whole.

	Visual impact on sensitive visual receptors in the region (5-10km)	Negative Low	Negative Low	Planning ● Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint. ● Where insufficient natural vegetation exists next to the property, a 'screen' can be planted using endemic, fast growers that are water efficient. Operations ● Maintain general appearance of the facility as a whole.
	Visual impacts of lighting at night on sensitive visual receptors in close proximity to the proposed project	Negative High	Negative Low	Planning & Operation ● Shield the source of light by physical barriers (walls, vegetation etc.) ● Limit mounting heights of lighting fixtures, or alternatively use footlights or bollard level lights. ● Make use of minimum lumen or wattage in fixtures. ● Make use of down-lighters, or shield fixtures. ● Make use of low-pressure sodium lighting or other types of low impact lighting. ● Make use of motion detectors on security lighting. This will allow the site to remain in relative darkness, until lighting is required for security or maintenance purposes.
	Visual impacts of solar glint and glare as a visual distraction and possible air travel hazard	Negative Medium Low	N/A	● No mitigation measures are required.
	Visual impacts on sensitive receptors located within a	Negative Low	Negative Low	Planning

	500m radius of the proposed power line			• Retain/re-establish and maintain natural vegetation immediately adjacent to the power line servitude. Operations • Maintain the general appearance of the servitude as a whole.
	Visual impacts and sense of place impacts associated with the operation phase	Negative Medium	Negative Low	• The subjectivity towards the project in its entirety can be influenced by creating a "Green Energy" awareness campaign, educating the local community and potentially tourists on the benefits of renewable energy. This can be achieved by also hosting an 'open day' where the local community can have the opportunity to view the completed project which may enlist a sense of pride in the renewable energy project in their area. • Implement good housekeeping measures.
Social Impact Assessment (Appendix D7)	Direct and Indirect employment opportunities and skills development	Positive Low	Positive Medium	Enhancement: • It is recommended that local employment policy is adopted to maximise the opportunities made available to the local community. • The recruitment selection process should seek to promote gender equality and the employment of women wherever possible. • Vocational training programs should be established to promote the development of skills.
	Development of non-polluting, renewable energy infrastructure	Positive Medium	Positive Medium	• No enhancement identified

	Potential loss of agricultural land	Negative Medium		Negative Low		• The proposed mitigation measures for the construction phase should have been implemented at this stage. • Mitigation measures from the Agricultural Compliance Statement should also be implemented (if any are relevant).
	Contribution to Local Economic Development (LED) and social upliftment	Positive Medium		Positive High		Enhancement: • A Community Needs Aanalysis must be conducted to ensure that the LED and social upliftment programmes proposed by the project are meaningful. • Ongoing communication and reporting are required to ensure that maximum benefit is obtained from the programmes identified, and to prevent the possibility for such programmes to be misused. • The programmes should be reviewed on an ongoing basis to ensure that they are best suited to the needs of the community at the time (bearing in mind that these are likely to change over time).
	Impact on tourism	Negative Low	Positive Low	Negative Low	Positive Low	• The impact rating is dependent on how the development is perceived by tourism. In some cases, renewable energy developments can be seen as an addition to the tourist industry in the area (positive low) or it can be viewed as a negative. The rating is subjective. • Due to the extent of the project no viable mitigation measures can be implemented to eliminate the visual impact of the PV panels, but the subjectivity towards the PV panels can be influenced by creating a “Green Energy” awareness campaign, educating the local community and tourists on the

				benefits of renewable energy. Tourists visiting the area should be made aware of South Africa's movement towards renewable energy. This might create a positive feeling of a country moving forward in terms of environmental sustainability. This could be implemented by constructing a visitor's centre on the property allocated to the proposed solar farm which should be open to school fieldtrips, the local community, and tourists
	Visual and sense of place impacts	Negative Low	Negative Low	● To effectively mitigate the visual impact and the impact on sense of place during the operational phase of the proposed Castor Solar PV Project, it is suggested that the recommendations made in the Visual Impact Assessment (specialist study) should be followed in this regard
Traffic Impact Assessment (Appendix D8)	Increased traffic during the operation phase	Negative Low	Negative Low	● The impact of the increased traffic during the operational phase is negligible due to the expected number of employees. The shift work provides mitigation and reduces the expected number of employees, especially during peak hours.

6.2.3 Impacts during the decommissioning phase

The physical environment will benefit from the closure of the Castor Solar PV Project since the site will be restored to its natural state. Table 6.6 provides a summary of the impacts during the decommissioning phase. The decommissioning phase will however potentially result in impact on soils, pressure on existing service infrastructure, surface water and the loss of permanent employment. Skilled staff will be eminently employable, and a number of temporary jobs will also be created in the process. Decommissioning of a PV facility will leave a positive impact on the habitat and biodiversity as the area will be rehabilitated to its natural state.

Table 6.6: Impacts and the mitigation measures during the decommissioning phase

SPECIALIST STUDY	IMPACT	PRE-MITIGATION RATING	POST MITIGATION RATING	SUMMARY OF MITIGATION MEASURES
Avifauna Impact Assessment (Appendix D2)	Direct mortality due to earthworks, vehicle collisions and persecution	Negative High	Negative Low	● All personnel must undergo environmental awareness including educating about not harming or collecting species. ● Prior to commencing work each day, two individuals must traverse the working area in order to disturb any fauna and so they have a chance to vacate. ● Any fauna threatened by the construction activities should be removed safely by an appropriately qualified environmental officer or removal specialist. ● All construction vehicles must adhere to a speed limit of maximum 40 km/h to avoid collisions. Appropriate speed control measures and signs must be erected. ● All hazardous materials, if any, must be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site must be cleaned up in the appropriate manner. ● Any excavations must not be left open for extended periods of time as fauna may fall in and become trapped in them. Excavations should only be dug when they are required and must be used and filled shortly thereafter.
	Continued habitat degradation due to Invasive Alien Plant	Negative Very High	Negative Low	● Rehabilitation in accordance with the Rehabilitation Plan for the development must be undertaken in areas disturbed during the decommissioning phase.

	encroachment and erosion			• Monitoring of the rehabilitated area must be undertaken at quarterly intervals for 3 years after the decommissioning phase. • All erosion problems observed must be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques. • There must be follow-up rehabilitation and revegetation of any remaining bare areas with indigenous flora.
Traffic Impact Assessment (Appendix D8)	Increased traffic during the decommissioning phase	Negative Low (insignificant)	Negative Low (insignificant)	• The impact of the increased traffic during the decommissioning phase is negligible due to the expected number of employees. • All decommissioning vehicles must be roadworthy and drivers must have the relevant licenses for the type of vehicles they are operating. • All vehicle drivers need to strictly adhere to the rules of the road.

6.3 SUMMARY OF RECOMMENDATIONS FROM SPECIALIST STUDIES

To address the key issues highlighted in the previous section the following specialist studies and processes were commissioned:

- Terrestrial Ecology Impact Assessment – The Biodiversity Company (see Appendix D1)
- Avifaunal Impact Assessment – The Biodiversity Company (see Appendix D2)
- Visual Impact Assessment – Donaway Environmental Consultants (see Appendix D3)
- Agriculture Compliance Statement – The Biodiversity Comany (see Appendix D4)
- Heritage Impact Assessment – JA van Schalkwyk Heritage Consultants (see Appendix D5)
- Palaeontological Impact Assessment (desktop) – Dr. John Almond (see Appendix D6)
- Social Impact Assessment – Donaway Environmental Consultants (see Appendix D7)
- Traffic Impact Assessment – BVi Consulting Engineers (see Appendix D8)
- Wetland Impact and Risk Assessment – The Biodiversity Company (see Appendix D9)

The following sections summarise the main findings from the specialist reports.

6.3.1 Issue 1: Heritage and archaeological impacts

South Africa's heritage resources comprise a wide range of sites, features, objects and beliefs. According to Section 27(18) of the National Heritage Resources Act (NHRA), No. 25 of 1999, no person may destroy, damage, deface, excavate, alter, remove from its original position, subdivide or change the planning status of any heritage site without a permit issued by the heritage resources authority responsible for the protection of such site. In accordance with Section 38 of the NHRA, an independent heritage consultant was therefore appointed to conduct a Heritage Impact Assessment (HIA) to determine if any sites, features or objects of cultural heritage significance occur within the proposed site. The main question which needs to be addressed is:

"Will the proposed development impact on any heritage or archaeological artefacts?"

According to the Heritage Impact Assessment (Appendix D5) 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 120 to 150 years.

The impacts expected to occur will be of a low significance based on the fact that no sites of cultural significance or value was identified or discovered.

For this proposed project, the assessment has determined that no sites, features or objects of cultural heritage significance occur in the project area, therefore no permits are required from SAHRA or the PHRA. 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.

From a heritage point of view, it is recommended that the proposed project be allowed to continue on acceptance of the mitigation measures presented and the conditions proposed.

6.3.2 Issue 2: Ecological Impacts

The potential impact of the proposed development on flora and fauna known to occur in the Free State Province had to be determined. The main question which needs to be addressed is:

"How will the proposed development impact on the ecology of the affected area?"

The Terrestrial Ecology Impact Assessment (Appendix D1) indicates that the project activities will have a negative effect on the natural environment of the area and site. Anthropogenic activities drive habitat destruction leading to the displacement of fauna and flora and possibly causing direct mortality. Land clearing destroys local wildlife habitat and can lead to the loss of local breeding grounds, nesting sites and wildlife movement corridors such as rivers, streams and drainage lines, or other locally important features. The removal of natural vegetation is likely to reduce the habitat available for all types of fauna species and hence reduce animal populations and species compositions within the area.

Considering the fact that only minor/low-impact to moderate anthropogenic activities are currently taking place throughout most of the region, only several existing negative impacts to biodiversity were observed within the site. These include:

- Historic land modification largely in the form of road and power infrastructure, and the associated land clearing;
- Air and noise pollution;
- Minor and major gravel roads (and associated vehicle traffic and the possibility of wildlife road mortalities);
- Invasive Alien Plants and weeds;
- Grazing from cattle and the local game farm mammals; and
- Fences and associated infrastructure.

The proposed activities associated with the Castor Solar PV Projects are likely to be of a high impact and relatively large footprint, and the careful placement of certain developments is therefore important so as to minimise the damage to natural resources.

The proposed activities will be conducted over the Grassy Thornveld habitat. These areas encompass indigenous vegetation that may be considered largely functional in nature and as such any irresponsible and/or medium to high impact activities will likely result in the loss of the following resources:

- Ecological Support Areas;
- Protected flora;
- Mature indigenous trees;
- SCC fauna species (through direct mortality during clearing and construction activities, or through indirect mortality via the inappropriate control of waste material); and

- Foraging and traversing routes, and/or nesting sites, relevant to the wide diversity of fauna that frequent the areas.

As the area and site is in a largely functional state, the loss of these resources would be considered significant. Therefore, mitigations must be put in place and implemented to prevent the total destruction of any valuable natural resources.

The main impacts that may be expected to occur, as a result of the proposed activities, include the following:

- Direct habitat loss and fragmentation;
- Degradation of surrounding habitat;
- Disturbance and displacement of SCC fauna;
- Direct mortality of fauna; and
- Introduction and further spreading of IAP and weed species.

All mitigation measures as recommended by the specialist must be implemented to reduce the significance of the impacts to an acceptable level. No fatal flaws are evident for the proposed project. The average post-mitigation impact significance for the project is moderately low.

It is recommended that a condition of the Environmental Authorisation be that a wet-season walkthrough of the site prior to the commencement of the construction phase be conducted. This is due to the fact that certain species are likely to have been unobservable during the first surveys as these were conducted during the dry season.

It is the opinion of the specialist that the Castor Solar PV Project may be favourably considered, based on the fact that the implementation of project-specific mitigation actions is likely to reduce the significance of the anticipated impacts to tolerable levels.

Figure 6.1 provides an indication of the terrestrial ecological sensitivity associated with the site.

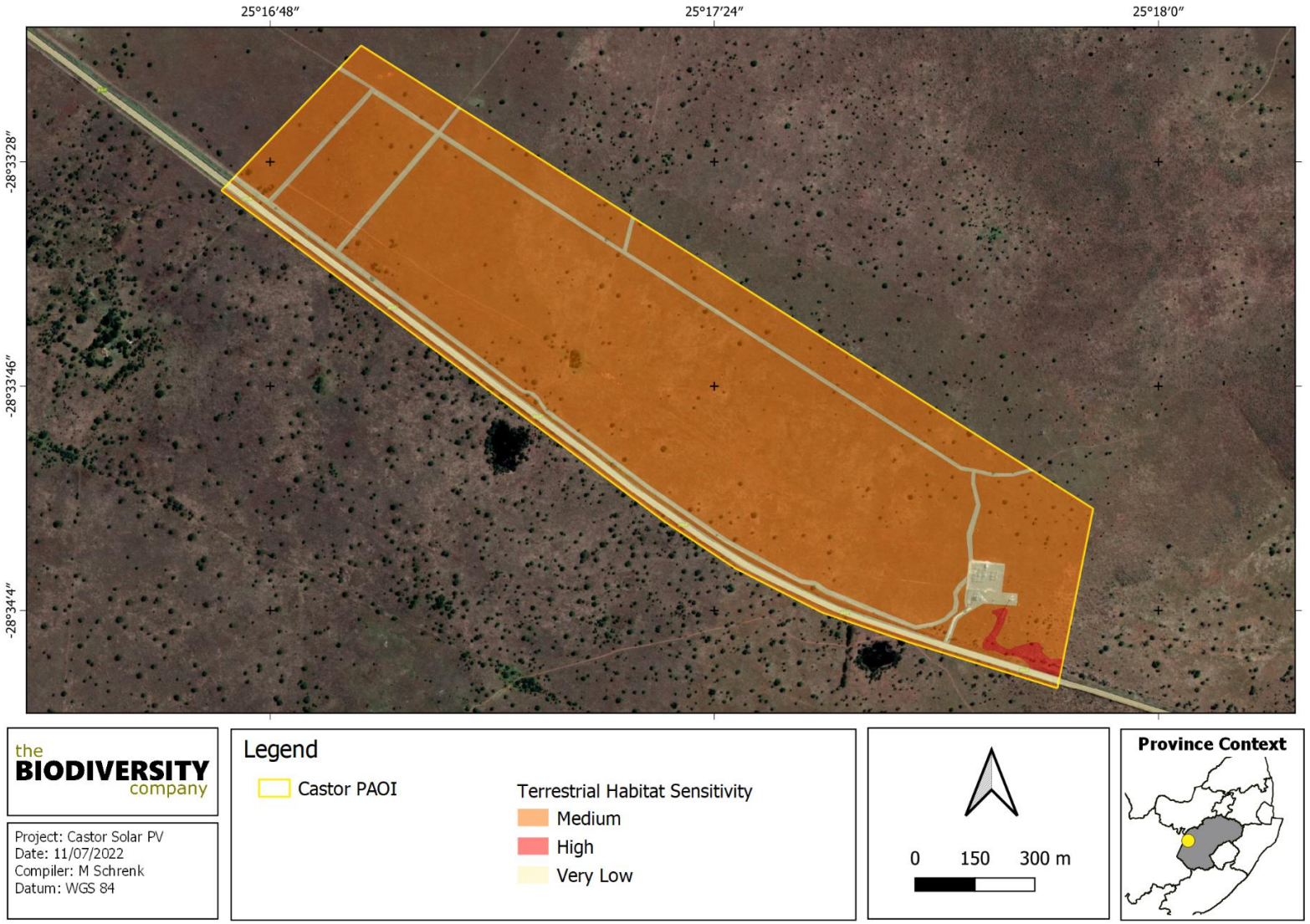


Figure 6.1: Ecological sensitivity map of the Castor Solar PV Project site

6.3.3 Issue 3: Wetland Risks / Impacts

The potential impact of the proposed development on wetlands known to occur on site, had to be determined. The main question which needs to be addressed is:

"How will the proposed development impact on the wetlands?"

According to the Wetland Impact and Risk Assessment (Appendix D9) two wetlands were identified within the 500 m regulated area around the site, however located outside of the actual site. The wetland areas were delineated in accordance with the DWAF (2005) guidelines. Both wetlands have been identified as depression wetlands and have been (jointly) assessed. Along with the two wetlands an artificial wetland (cement dam) was identified near the southern boundary of the site. Although this system does not classify as a wetland system it is important to note where this dam is for any planned development in the area.

Due to the fact that direct impacts to the wetlands (and buffers) will be avoided, only indirect risks/impacts posed to these systems as a result of the project were considered. All impacts were assessed to be of a low significance prior to the implementation of the recommended mitigation measures.

Based on the results and conclusions presented in the specialist report, it is expected that the proposed activities will pose low residual risks on the wetlands and therefore no fatal flaws were identified for the project. A General Authorisation (GN 509 of 2016) is required for the water use authorisation for the Castor Solar PV Project.

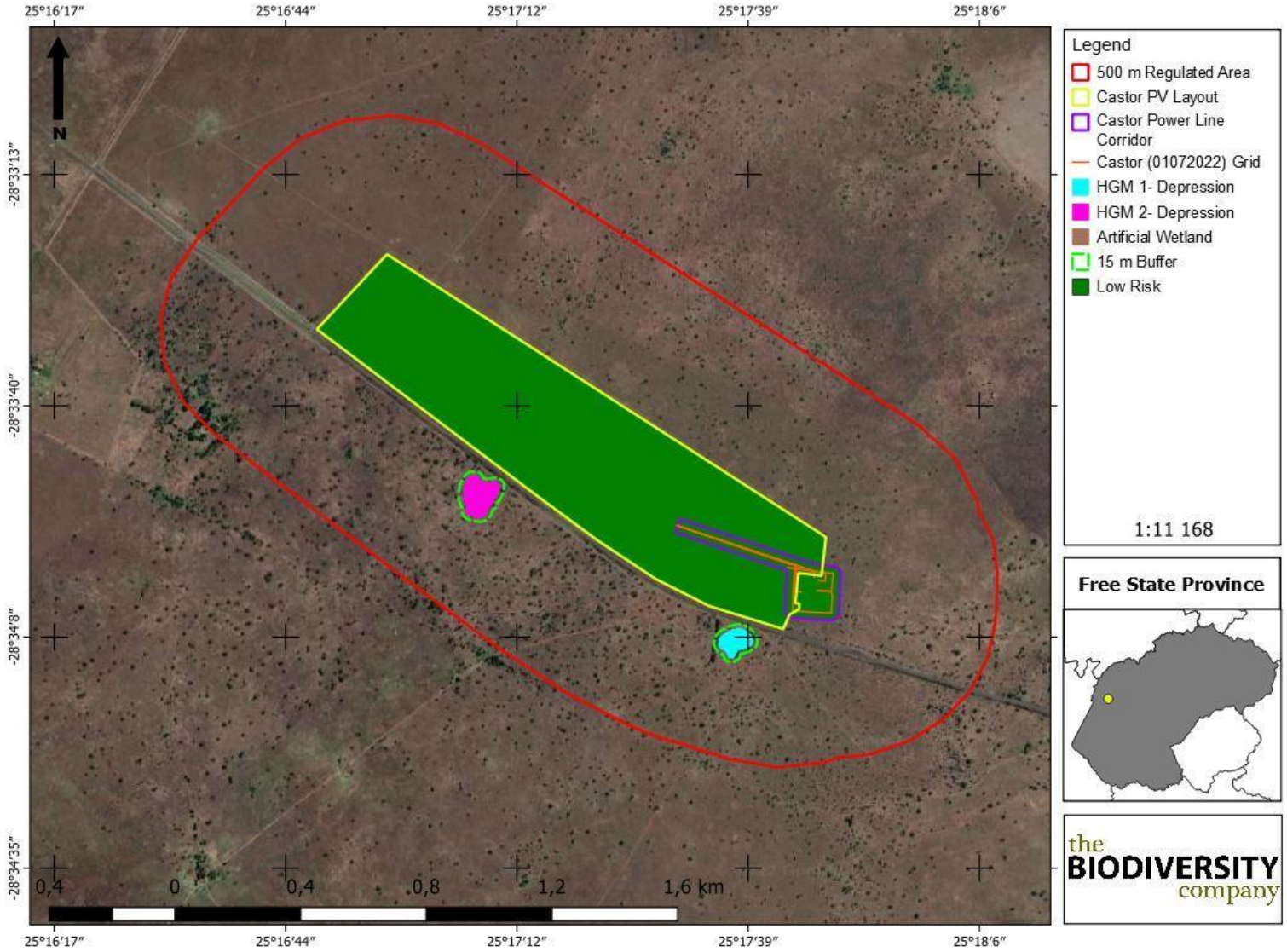


Figure 6.2: Wetland /riparian sensitivity map of the Castor Solar PV Project site

6.3.4 Issue 4: Avifaunal Impacts

The potential impact of the proposed development on birds known to occur in Free State Province had to be determined. The main question which needs to be addressed is:

"How will the proposed development impact on the avifauna?"

According to the Avifauna Impact Assessment (Appendix D2), the site was observed to support a depauperate avifauna species community with only with only 21 species recorded, accounting for approximately 11% of the total number of expected species. This was attributed to the homogenous habitat structure within the site. The dominant species comprised of those that are typically considered to be 'tolerant' or non-sensitive species. A single Species of Conservation Concern (SCC), *Sagittarius serpentarius* (Secretarybird) was observed within the site, with no evidence of nesting sites. There are a further two SCC that have a high likelihood of occurrence within the site.

The main expected impacts of the proposed Castor Solar PV Project and associated infrastructure will include the following:

- Habitat loss and fragmentation;
- Electrocutions; and
- Collisions.

Mitigation measures as recommended by the independent specialist must be implemented to reduce the significance of the risk to an acceptable residual risk level. Considering the above-mentioned information and that the facility is located within a REDZ, it is the opinion of the specialist that the project may be favourably considered, on condition that all the mitigation and recommendations provided and other specialist reports are implemented.

6.3.5 Issue 5: Visual Impacts

Due to the extent of the proposed Castor Solar PV Project it is expected that the plant will result in potential visual impacts. The main question which needs to be addressed is:

"To what extent will the proposed development be visible to observers and to what extent will the landscape provides any significant visual absorption capacity"

The Visual Impact Assessment (Appendix D3) confirms that the construction and operational phases of the Castor Solar PV Project and its associated infrastructure will have a visual impact on the area, especially within (but not restricted to) a 5km radius of the project. The visual impact will differ amongst places, depending on the distance of the project.

The visual landscape mainly consists of agricultural developments with a better visual appearance. Permanent residents of the area might be desensitised over time with the construction of more solar energy facilities, but it will stay subjective for each viewer.

Due to the height of the power line (32m) and the extent of the project, no viable mitigation measures can be implemented to fully eliminate the visual impact of the facility and power line, but the possible visual impacts can be reduced. Several mitigation measures have however been proposed regardless of whether mitigation measures will reduce the significance of the of the anticipated impacts, they

are considered good practice and should be implemented and maintained throughout the construction, operational and decommissioning phases of the project.

In terms of possible landscape degradation, the landscape does not appear to have any specific protection and is characterised by farming development.

Aesthetic issues are subjective, and some people find solar energy facilities and their associated infrastructure pleasant and optimistic while others may find it visually invasive; it is mostly perceived as symbols of energy independence; and local prosperity. The visual impact is also dependant on the land use of an area and the sensitivity thereof in terms of visual impact, such as protected areas, parks and other tourism related activities.

Considering all positive factors of such a development including economic factors, social factors and sustainability factors, especially in a semi-arid country, the visual impact of this proposed development will be insignificant and is suggested that the development commence, from a visual impact point of view. The specialist has recommended that the project be approved.

6.3.6 Issue 6: Agricultural / impacts on the soil

In order to determine the potential impacts that the proposed development will have on agricultural production, the soil forms and current land capability of the area where the proposed project will be situated was investigated. The main question which needs to be addressed is:

"To what extent will the proposed development compromise (negative impacts) or enhance (positive impacts) current and/or potential future agricultural production?"

The Agriculture Compliance Statement (Appendix D4) has considered the sensitivity of the site and has verified that the site is of a low and medium high sensitivity, with the DAFF land capability sensitivity confirmed as being low to very low and low to moderate. In terms of the protocols and the associated requirements, the specialist confirms that the undertaking of a Compliance Statement is relevant and therefore an impact assessment was not undertaken for the development.

The specialist further confirms that the site is associated with non-arable lands. The available climate limits crop production significantly. The harsh climatic conditions are associated with low annual rainfall and high evapotranspiration potential demands of the area, which consequently result into a very restricted choice of crops due to the heat and moisture stress. The area is not favourable for most cropping practices, which corresponds to the current livestock and game farming activities in the area.

It is the specialist's opinion that the proposed Castor Solar PV Project and associated infrastructure will have negligible impacts on the agricultural production ability of the land. It is, therefore, the specialist`s recommendation that, the project may be favourably considered for development with no significant impacts expected to occur, and therefore, no specific mitigation measures are required to be implemented.

6.3.7 Issue 7: Socio-economic impacts

A Social Impact Assessment has been compiled in order to provide a description of the environment that may be affected by the activity and the manner in which the environment may be affected by the proposed facility; to provide a description and assessment of the potential social issues associated with the proposed facility; and the identification of enhancement and mitigation aimed at maximizing

opportunities and avoiding and or reducing negative impacts (refer to Appendix D7). The main question which needs to be addressed is:

"How will the proposed development impact on the socio-economic environment?"

There are some vulnerable communities within the area that may be affected by the development of Castor Solar PV Project and its associated infrastructure. Traditionally, the construction phase of a PV solar development is associated with most social impacts. Many of the social impacts are unavoidable and will take place to some extent but can be managed through the careful planning and implementation of appropriate mitigation measures. Several potential positive and negative social impacts have been identified for the project, however an assessment of the potential social impacts indicated that there are no perceived negative impacts that are sufficiently significant to allow them to be classified as "fatal flaws".

Based on the social impact assessment, the following general conclusions and findings can be made:

- The potential negative social impacts associated with the construction phase are typical of construction related projects and not just focussed on the construction of solar PV projects (these relate to an influx of non-local workforce and jobseekers, intrusion and disturbance impacts (i.e., noise and dust, wear and tear on roads) and safety and security risks) and could be reduced with the implementation of the mitigation measures proposed. The significance of such impacts on the local communities can therefore be mitigated.
- The development will introduce employment opportunities during the construction phase (temporary employment) and a limited number of permanent employment opportunities during operation phase.
- The proposed project could assist the local economy in creating entrepreneurial growth and opportunities, especially if local business is involved in the provision of general material, goods and services during the construction and operational phases. This positive impact is likely to be compounded by the cumulative impact associated with the development of several other solar facilities within the surrounding area, and because of the project's location within an area which is characterised by high levels of solar irradiation, and which is therefore well suited to the development of commercial solar energy facilities.
- The proposed development also represents an investment in infrastructure for the generation of non-polluting, Renewable Energy, which, when compared to energy generated because of burning polluting fossil fuels, represents a positive social benefit for society.
- It should be noted that the perceived benefits associated with the project, which include Renewable Energy generation and local economic and social development, outweigh the perceived impacts associated with the project.

The proposed mitigation measures should be implemented to limit the negative impacts and enhance the positive impacts associated with the project. Based on the social assessment, the following recommendations are made:

- The appointment of a CLO to assist with the management of social impacts and to deal with community issues, if feasible.
- It is imperative that local labour be sourced, wherever possible, to ensure that benefits accrue to the local communities. Efforts should be made to involve local businesses during the

construction activities, where possible. Local procurement of labour and services / products would greatly benefit the community during the construction and operational phases of the project.

- Local procurement of services and equipment is required where possible in order to enhance the multiplier effect.
- Involve the community in the process as far as possible (encourage co-operative decision making and partnerships with local entrepreneurs).
- Employ mitigation measures to minimise the dust and noise pollution and damage to existing roads.
- Safety and security risks should be considered during the planning / construction phase of the proposed project. Access control, security and management should be implemented to limit the risk of crime increasing in the area.

The proposed project and associated infrastructure are unlikely to result in permanent damaging social impacts. From a social perspective it is concluded that the project could be developed subject to the implementation of recommended mitigation measures and management actions identified for the project.

6.3.8 Issue 8: Paleontological Impacts

South Africa's heritage resources comprise a wide range of sites, features, objects and beliefs. According to Section 27(18) of the National Heritage Resources Act (NHRA), No. 25 of 1999, no person may destroy, damage, deface, excavate, alter, remove from its original position, subdivide or change the planning status of any heritage site without a permit issued by the heritage resources authority responsible for the protection of such site. The main question which needs to be addressed is:

"How will the proposed development impact on the Palaeontological resources?"

According to the Palaeontological Impact Assessment (desktop) (Appendix D6) undertaken for the solar energy facility previously authorised within the site, the area is underlain by Permian basinal mudrocks of the Tierberg Formation (Ecca Group) and Late Caenozoic calcretes and pan sediments, all of which are of medium palaeontological sensitivity. However, the proposed site is underlain by Early Jurassic intrusive igneous rocks of the Karoo Dolerite Suite that are entirely unfossiliferous. The impact significance of the Castor Solar PV Project on local fossil heritage resources, given its limited footprint and underlying geology, is considered to be low. It is therefore considered that the proposed development is deemed appropriate and will not lead to detrimental impacts on the palaeontological reserves of the area. Therefore, the construction of the development may be authorised in its whole extent.

6.3.9 Issue 9: Traffic Impacts

Large developments are normally associated with an increase in construction vehicle traffic. The main question which needs to be addressed is:

"How will the proposed development impact on the traffic on main delivery routes to the site?"

According to the Traffic Impact Assessment (Appendix D8) the impact of the construction, operation and decommissioning trip generation, on the future background traffic volumes near the Castor Solar

PV Project and along transportation routes, are expected to be low prior to the implementation of the recommended mitigation measures.

During the construction phase, the road network leading to the project will include national and regional roads from Durban/ Richards Bay and Johannesburg. There will be an increase in traffic volumes, for both light and heavy vehicles, influencing traffic congestion and road safety. The road network, surrounding the project will also be affected. There will be an increase in traffic influencing traffic congestion and road safety. However, vehicles used for the operations and maintenance phase will be light vehicles. The extent of the road network that will be affected is small, as staff will be living in neighbouring towns, i.e. Boshof and Dealesville. The operations and maintenance phase traffic will only be temporary, and no major traffic impact is anticipated on the road network.

The construction traffic accessing the site would be traveling along roads that are proposed to be unsurfaced for the development. The movement of heavy vehicles along the gravel roads, especially close to the boundaries of the site, may cause excessive dust in the area. Deterioration of gravel roads may also occur after wet seasons, leading to poor road conditions for transportation on site.

The current traffic will increase slightly due to the employees on site during the operational phase. The traffic generated during this phase will be minimal and will not have any impact on the surrounding road network.

The preferred access point to the site is situated off an unknown gravel road off the R64. The formalisation of this access point, to the standard, might be a requirement as part of the wayleave approval of the Free State Department: Police, Roads and Transport.

The development is supported from a transport perspective provided that the recommendations and mitigations contained in this report are adhered to. The impacts associated with the proposed Castor Solar PV Project are acceptable.

6.4 SENSITIVITY ANALYSIS

The sensitivity analysis undertaken as part of the BAR focusses on providing an understanding of the environmentally sensitive areas and features identified within the site under assessment, as well as the grid connection corridor. This section considers the findings of each of the independent specialist studies undertaken for the development and describes the sensitive features and areas identified, including the location, the sensitivity rating of the features or areas as well as the associated buffers recommended by the specialist (where a buffer is considered to be relevant). The sensitive areas and features identified are also displayed on the sensitivity map included as Figure H1-H2 of this BA report.

The following points below provide the sensitivity analysis for the Castor Solar PV Project:

<u>Ecology:</u>

The Terrestrial Ecology Impact Assessment (refer to Appendix D1) has considered the ecological features present within the site. Each of the three habitats delineated within the site have been graded by the specialist accordingly. The three habitats include Rocky Thornveld, Grassy Thornveld and Transformed areas.

The Rocky Thornveld is of a high ecological sensitivity and therefore needs to be avoided by development. The Grassy Thornveld is of a medium ecological sensitivity and the Transformed areas are of a very low ecological sensitivity.

The Rocky Thornveld is located within the south eastern corner of the site, near the Bosplaat Rural Substation. This area has been considered by the Applicant and is not being considered for the placement of any infrastructure. The layout included as Figure I illustrates this avoidance and compliance with the recommendations made by the specialist.

Wetlands / Riparian Areas:

The Wetland Impact and Risk Assessment (refer to Appendix D9) has considered the features present within the site that could be affected and has made the following observations in this regard:

Two wetlands were identified within the 500 m regulated area around the site, however located outside of the actual site. The wetland areas were delineated in accordance with the DWAF (2005) guidelines. Both wetlands have been identified as depression wetlands and have been (jointly) assessed. Along with the two wetlands an artificial wetland (cement dam) was identified near the southern boundary of the site. Although this system does not classify as a wetland system it is important to note where this dam is for any planned development in the area.

Based on the locations of the two wetlands outside of the site, no consideration is required for the placement of the layout from a wetland perspective.

Avifauna:

No specific areas of sensitivity have been identified from an avifauna perspective (Avifauna Impact Assessment, Appendix D2), with the majority of the site being classified as being of a medium avifauna perspective.

Therefore, from an avifauna perspective, no areas have been identified as no-go for the development of the project and associated infrastructure.

Visual:

No specific areas of sensitivity have been identified from a visual perspective (Visual Impact Assessment, Appendix D3). Therefore, from a visual perspective, no areas have been identified as no-go for the development of the Castor Solar PV Project and associated infrastructure.

Heritage:

No sites, features or objects of cultural significance from the Stone Age, Iron Age or the historic period were identified on site. Therefore, no specific features of sensitivity have been identified from a heritage perspective that needs to be avoided by the placement of infrastructure associated with the Castor Solar PV project development.

Palaeontology:

No palaeontological no-go areas have been identified for the project (Palaeontological Impact Assessment, Appendix D6). Therefore, from a palaeontological perspective, no areas have been identified as no-go for the development of the Castor Solar PV Project and associated infrastructure.

Social:

No specific areas of sensitivity have been identified from a social perspective (Social Impact Assessment, Appendix D7). Therefore, from a social perspective, no areas have been identified as no-go for the development of the Castor Solar PV Project and associated infrastructure.

Traffic:

No specific areas of sensitivity have been identified from a traffic perspective (Traffic Impact Assessment, Appendix D8). Therefore, from a traffic perspective, no areas/road aspects have been identified as no-go for the development of the Castor Solar PV Project and associated infrastructure.

Agriculture:

The harsh climatic conditions are associated with low annual rainfall and high evapotranspiration potential demands of the area, which consequently result into a very restricted choice of crops due to the heat and moisture stress. The area is not favourable for most cropping practices, which corresponds to the current livestock and game farming activities in the area.

Considering the above, no specific areas of sensitivity have been identified from a soils or agricultural perspective (Agricultural Compliance Statement, Appendix D4). Therefore, from a soils and agricultural perspective, no areas have been identified as no-go for the development of the project and associated infrastructure.

6.5 METHOD OF ENVIRONMENTAL ASSESSMENT

The environmental assessment aims to identify the various possible environmental impacts that could results from the proposed activity. Different impacts need to be evaluated in terms of its significance and in doing so highlight the most critical issues to be addressed.

Significance is determined through a synthesis of impact characteristics which include context and intensity of an impact. Context refers to the geographical scale i.e. site, local, national or global whereas intensity is defined by the severity of the impact e.g. the magnitude of deviation from background conditions, the size of the area affected, the duration of the impact and the overall probability of occurrence. Significance is calculated as shown in Table 6.7.

Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The total number of points scored for each impact indicates the level of significance of the impact.

6.5.1 Impact Rating System

Impact assessment must take account of the nature, scale and duration of impacts on the environment whether such impacts are positive or negative. Each impact is also assessed according to the project phases:

- planning
- construction
- operation
- decommissioning

Where necessary, the proposal for mitigation or optimisation of an impact should be detailed. A brief discussion of the impact and the rationale behind the assessment of its significance should also be included. The rating system is applied to the potential impacts on the receiving environment and includes an objective evaluation of the mitigation of the impact. In assessing the significance of each impact the following criteria is used:

Table 6.7: The rating system

NATURE		
Include a brief description of the impact of environmental parameter being assessed in the context of the project. This criterion includes a brief written statement of the environmental aspect being impacted upon by a particular action or activity.		
GEOGRAPHICAL EXTENT		
This is defined as the area over which the impact will be experienced.		
1	Site	The impact will only affect the site.
2	Local/district	Will affect the local area or district.
3	Province/region	Will affect the entire province or region.
4	International and National	Will affect the entire country.
PROBABILITY		
This describes the chance of occurrence of an impact.		
1	Unlikely	The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).
2	Possible	The impact may occur (Between a 25% to 50% chance of occurrence).
3	Probable	The impact will likely occur (Between a 50% to 75% chance of occurrence).
4	Definite	Impact will certainly occur (Greater than a 75% chance of occurrence).
DURATION		
This describes the duration of the impacts. Duration indicates the lifetime of the impact as a result of the proposed activity.		
1	Short term	The impact will either disappear with mitigation or will be mitigated through natural processes in a span shorter than the construction phase (0 – 1 years), or the impact will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).

2	Medium term	The impact will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).
3	Long term	The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 30 years).
4	Permanent	The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered indefinite.
INTENSITY/ MAGNITUDE		
Describes the severity of an impact.		
1	Low	Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.
2	Medium	Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).
3	High	Impact affects the continued viability of the system/ component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.
4	Very high	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired. Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.
REVERSIBILITY		
This describes the degree to which an impact can be successfully reversed upon completion of the proposed activity.		
1	Completely reversible	The impact is reversible with implementation of minor mitigation measures.

2	Partly reversible	The impact is partly reversible but more intense mitigation measures are required.
3	Barely reversible	The impact is unlikely to be reversed even with intense mitigation measures.
4	Irreversible	The impact is irreversible and no mitigation measures exist.
IRREPLACEABLE LOSS OF RESOURCES		
This describes the degree to which resources will be irreplaceably lost as a result of a proposed activity.		
1	No loss of resource	The impact will not result in the loss of any resources.
2	Marginal loss of resource	The impact will result in marginal loss of resources.
3	Significant loss of resources	The impact will result in significant loss of resources.
4	Complete loss of resources	The impact is result in a complete loss of all resources.
CUMULATIVE EFFECT		
This describes the cumulative effect of the impacts. A cumulative impact is an effect which in itself may not be significant but may become significant if added to other existing or potential impacts emanating from other similar or diverse activities as a result of the project activity in question.		
1	Negligible cumulative impact	The impact would result in negligible to no cumulative effects.
2	Low cumulative impact	The impact would result in insignificant cumulative effects.
3	Medium cumulative impact	The impact would result in minor cumulative effects.
4	High cumulative impact	The impact would result in significant cumulative effects
SIGNIFICANCE		
Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The calculation of the significance of an impact uses the following formula: (Extent + probability + reversibility + irreplaceability + duration + cumulative effect) x magnitude/intensity.		

The summation of the different criteria will produce a non-weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating.		
Points	Impact significance rating	Description
6 to 28	Negative low impact	The anticipated impact will have negligible negative effects and will require little to no mitigation.
6 to 28	Positive low impact	The anticipated impact will have minor positive effects.
29 to 50	Negative medium impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures.
29 to 50	Positive medium impact	The anticipated impact will have moderate positive effects.
51 to 73	Negative high impact	The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact.
51 to 73	Positive high impact	The anticipated impact will have significant positive effects.
74 to 96	Negative very high impact	The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws".
74 to 96	Positive very high impact	The anticipated impact will have highly significant positive effects.

7 CUMULATIVE EFFECTS ASSESSMENT

This section aims to address the following requirements of the regulations:

Appendix 1. (3)(i) An BAR (...) must include-
(j) an assessment of each identified potentially significant impact and risk, including- (i) cumulative impacts.

7.1 INTRODUCTION

The EIA Regulations (as amended) determine that cumulative impacts, "*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*." Cumulative impacts can be incremental, interactive, sequential or synergistic. EIAs have traditionally failed to come to terms with such impacts, largely as a result of the following considerations:

- Cumulative effects may be local, regional or global in scale and dealing with such impacts requires coordinated institutional arrangements;
- Complexity - dependent on numerous fluctuating influencing factors which may be completely independent of the controllable actions of the proponent or communities; and
- Project level investigations are ill-equipped to deal with broader biophysical, social and economic considerations.

Despite these challenges, cumulative impacts have been afforded increased attention in this Basic Assessment Report and for each impact a separate section has been added which discusses any cumulative issues, and where applicable, draws attention to other issues that may contextualise or add value to the interpretation of the impact. This chapter analyses the proposed project's potential cumulative impacts in more detail by: (1) defining the geographic area considered for the cumulative effects analysis; (2) providing an overview of relevant past and present actions in the project vicinity that may affect cumulative impacts; (3) presenting the reasonably foreseeable actions in the geographic area of consideration; and (4) determining whether there are adverse cumulative effects associated with the resource areas analysed.

The term "Cumulative Effect" has for the purpose of this report been defined as: the summation of effects over time which can be attributed to the operation of the project itself, and the overall effects on the ecosystem of the site that can be attributed to the project and other existing and planned future projects.

7.2 GEOGRAPHIC AREA OF EVALUATION

The geographic area of evaluation is the spatial boundary in which the cumulative effects analysis was undertaken. The spatial boundary evaluated in this cumulative effects analysis generally includes an area of a 30km radius surrounding the proposed development – refer to Figure 7.1 below and Figure G.

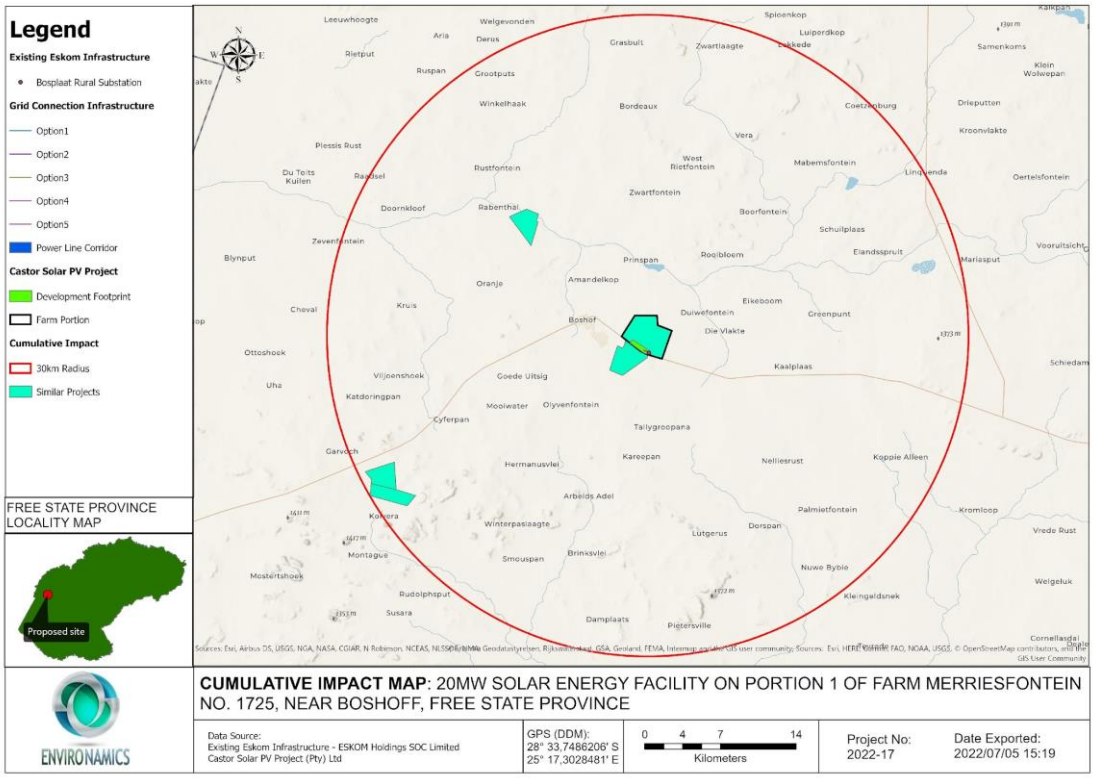


Figure 7.1: Geographic area of evaluation with utility-scale renewable energy generation sites

The geographic spread of solar PV projects, administrative boundaries and any environmental features (the nature of the landscape) were considered when determining the geographic area of investigation. It was argued that a radius of 30km would generally confine the potential for cumulative effects within this particular environmental landscape. The geographic area includes projects located within the Free State Province and Northern Cape Province. A larger geographic area may be used to analyse cumulative impacts based on the specific temporal or spatial impacts of a resource. For example, the socio-economic cumulative analysis may include a larger area, as the construction workforce may draw from a much wider area. The geographic area of analysis is specified in the discussion of the cumulative impacts for that resource where it differs from the general area of evaluation described above.

7.3 TEMPORAL BOUNDARY OF EVALUATION

A temporal boundary is the timeframe during which the cumulative effects are reasonably expected to occur. The temporal parameters for this cumulative effects analysis are the anticipated lifespan of the proposed project, beginning in 2023 and extending over at least 20 years, which is the minimum expected project life of the proposed project. Where appropriate, particular focus is on near-term cumulative impacts of overlapping construction schedules for proposed projects in the area of evaluation.

7.4 OTHER PROJECTS IN THE AREA

The following section provides details on existing projects, and projects being proposed in the geographical area of evaluation.

7.4.1 Existing projects in the area

According to the DFFE's database three (3) PV solar plant applications (of which one application has lapsed) have been submitted to the Department within the geographic area of investigation, – refer to Table 7.1. It should be noted that there is uncertainty with regards to the accuracy and validity of the information obtained from the Departments database as regular updates are not always applied as the status of projects change.

Table 7.1: A summary of related facilities, that may have a cumulative impact, in a 30 km radius of the study area

Site name	Distance from study area	Proposed generating capacity	DEFF reference	EIA process	Project status
Wag 'n Bietjiespan Solar Farm	23km	70 MW	12/12/20/1862	Scoping and EIA	In process
60MW Tokologo LM PV Facility	10km	60MW	12/12/20/2342	Scoping and EIA	Approved
Boshof Les Marais / BuitenfonteI n 5MW solar energy facility	0km	5MW	14/12/16/3/3/1/1090	BAR	Lapsed/ withdrawn

It is unclear whether other projects not related to renewable energy is to be constructed in this area, and whether other projects are proposed. In general, development activity in the area is focused on agriculture and mining. It is quite possible that future solar farm development may take place within the general area.

Furthermore, the Boshof Les Marais / BuitenfonteIn 5MW solar energy facility is the facility referred to in the upfront sections of the report which was authorised previously on the site, but which is being replaced by the current Application for Environmental Authorisation for the Castor Solar PV Project. Therefore this development is not relevant to be considered and assessed as part of the cumulative impact assessment.

7.4.2 Projects in the foreseeable future

The geographic area of investigation has been quite limited in Applications for Environmental Authorisation for the development of solar energy facilities. It must however be noted that projects in the future are expected in the area based on the current growth of the renewable energy sector in the country.

7.5 SPECIALIST INFORMATION ON CUMULATIVE EFFECTS

In line with the Terms of Reference (ToR) provided, specialists were asked to, where possible, take into consideration the cumulative effects associated with the proposed development and other projects which are either developed or in the process of being developed in the local area – refer to Figure 7.2 for a process flow. The following sections present their findings.

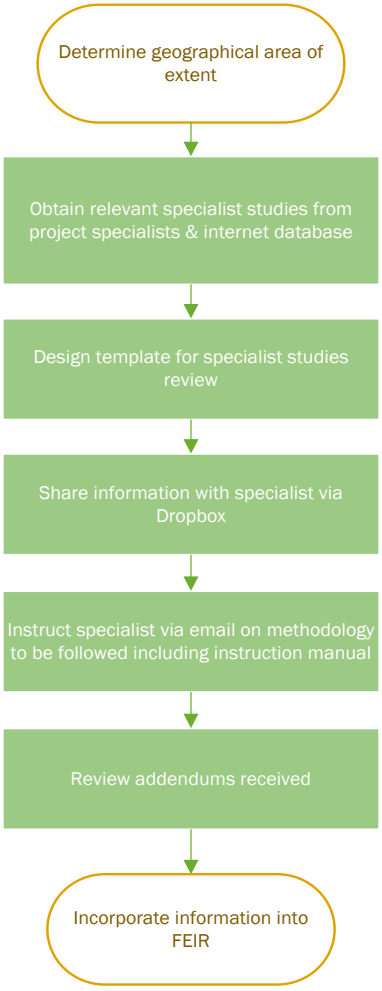


Figure 7.2: Process flow diagram for determining cumulative effects

7.5.1 Soil, Land Capability and Agricultural Potential

According to the Agriculture Compliance Statement (Appendix D4) no impacts (including cumulative) have been identified for the project based on the low sensitivity of the site, as well as the limited extent of the project development footprint (~40ha). This is in line with the requirements of the protocols for the undertaking of the Compliance Statement which mainly verifies the sensitivity of the site.

Based on the low sensitivity of the site negligible impact is expected to occur and therefore it is concluded that the cumulative impact cannot exceed acceptable levels of change in terms of

agricultural land loss. The cumulative impact of the development and its associated infrastructure is therefore assessed as negligible.

The negligible impact is also supported by the limited number of area developments within the geographic area of investigation.

7.5.2 Terrestrial Ecology

The Terrestrial Ecology Impact Assessment (Appendix D1) indicates that long-term cumulative impacts associated with the site development activities can lead to the loss of endemic and threatened species, including natural habitat and vegetation types, and these impacts can even lead to the degradation of conserved areas such as the adjacent game parks and reserves.

The site is located in the Kimberly Thornveld vegetation type. A total area of the habitat type within the 30 km radius equates to approximately 132,573 ha of Kimberly Thornveld habitat. Should the development of the Castor Solar PV Project take place it will equate to 0.08% of habitat area being lost due to the development. Based on this, the overall impact of the proposed development considered in isolation is expected to be low.

Based largely on the fact that several small PV areas exist and are planned nearby, and power line infrastructure occurs nearby, the cumulative effects of the proposed project are rated as Medium. This means that careful management and planning pertaining to the entire region must be a priority, and existing large infrastructure projects must be carefully monitored over the long term.

7.5.3 Wetlands

The Wetland Impact and Risk Assessment (Appendix D9) has confirmed that there are no wetland features present within the site that will be directly impacted by the development of the Castor Solar Power Project and based on this no cumulative impact assessment is relevant to the proposed project from a wetland perspective, as no direct impact is expected to occur for the project in isolation.

7.5.4 Avifauna

The Avifauna Impact Assessment (Appendix D2) indicates that localised cumulative impacts include those from operations that are close enough to potentially cause additive effects on the local environment or any sensitive receivers (such as nearby large road networks, other solar PV facilities, and power infrastructure). Relevant activities and impacts include dust deposition, noise and vibration, loss of corridors or habitat, disruption of waterways, groundwater drawdown, groundwater and surface water depletion, and transport activities. Long-term cumulative impacts associated with the site development activities can lead to the loss of endemic and threatened species, including natural habitat and vegetation types, and these impacts can even lead to the degradation of conserved areas such as the adjacent game parks and reserves.

The proposed Castor Solar PV project in isolation has a negative low impact significance. In consideration of the aforementioned information, the cumulative impact was determined to be of a negative medium significance. This is based on the consideration of the remnants layer released as part of the National Biodiversity Assessment (Skowno et al, 2019) and provides the present spatial extent of vegetation. The predominant remaining vegetation types within the landscape comprise of the Kimberley Thornveld and Western Free State Clay Grassland. Other projects located within the landscape was also considered by the specialist.

7.5.5 Socio-Economic

The Social Impact Assessment (Appendix D7) indicates that the potential for cumulative impacts to occur as a result of the surrounding projects are possible. Potential cumulative impacts identified for the project include positive impacts on the economy, business development, and employment, as well as negative impacts such as an influx of jobseekers and change in the area's sense of place.

The Castor Solar PV Project and the establishment of other solar power projects within the area has the potential to result in significant positive cumulative impacts, specifically with regards to the creation of several socio-economic opportunities for the region, which in turn, can result in positive social benefits. The positive cumulative impacts include creation of employment, skills development and training opportunities, and downstream business opportunities. The cumulative benefits to the local, regional, and national economy through employment and procurement of services are more considerable than that of the Castor Solar PV Project alone.

While the development of a single solar power project may not result in a major influx of people into an area, the development of several projects may have a cumulative impact on the in-migration and movement of people. In addition, the fact that the project is proposed within an area characterised by good levels of solar irradiation suitable for the development of commercial solar energy facilities implies that the surrounding area is likely to be subject to considerable future applications for PV energy facilities. Levels of unemployment, and the low level of earning potential may attract individuals to the area in search of better employment opportunities and higher standards of living. It is exceedingly difficult to control an influx of people into an area, especially in a country where unemployment rates are high. It is therefore important that the project proponent implement and maintain strict adherence with a local employment policy in order to reduce the potential of such an impact occurring

The positive cumulative impacts will be of a medium significance and the negative cumulative impacts will also be of a medium significance.

7.5.6 Visual

The Visual Impact Assessment (Appendix D3) indicates that the proposed development is located in a close proximity to existing Eskom power infrastructure and mines and will have a cumulative impact on viewers. Other solar energy facilities are also proposed in the area and the potential for cumulative impacts to occur as a result of the projects is therefore likely. The visual landscape mainly consists of agricultural mining developments with a better visual appearance. Permanent residents of the area might be desensitised over time with the construction of more solar energy facilities, but will stay subjective for each viewer. The location of the solar energy facilities within the area will contribute to the consolidation of structures to this locality and avoid a potentially scattered proliferation of solar energy infrastructure throughout the region.

The significance of the cumulative visual impacts is medium.

7.5.7 Heritage Impact Assessment

From a review of available databases, publications, as well as available heritage impact assessments done for the purpose of developments in the region, it was determined that the Castor Solar PV Project is located in an area with a very low presence of heritage sites and features. The cultural

heritage profile of the larger region is very low. Most frequently found are farmsteads, formal and informal burial sites. For this review, heritage sites located in urban areas have been excluded.

Heritage resources are sparsely distributed on the wider landscape with highly significant (Grade 1) sites being rare. Because of the low likelihood of finding further significant heritage resources in the area of the proposed development and the generally low density of sites in the wider landscape the overall impacts to heritage are expected to be of generally low significance before mitigation.

For the project area, the impacts to heritage sites are expected to be of low significance. However, this can be ameliorated by implementing mitigation measures, including isolating sites, relocating sites (e.g. burials) and excavating or sampling any significant archaeological material found to occur within the project area during the project development phases. The chances of further such material being found, however, are considered to be negligible. After mitigation, the overall impact significance would therefore be low.

7.5.8 Traffic Impact Assessment

The Traffic Impact Assessment (Appendix D8) indicates that depending on the timing of the other nearby renewable energy projects, where construction in particular could overlap, the traffic impact will increase accordingly. It should be noted that the volume of traffic is related to the specific development stage, logistics planning and development size.

The construction period for other renewable energy projects is relatively short, where traffic flow will vary during the construction period. It is assumed that 50% of these projects' construction periods would likely coincide with the Castor Solar PV Project construction period. This additional traffic, however, will be widely dispersed and easily accommodated on the surrounding road network. In addition, the traffic impact of the operational and maintenance periods will be low/ negligible and it is also unlikely that the decommissioning of these projects will coincide with each other.

It can be assumed that only the regional routes could be assessed cumulatively, as the local routes would differ for each site's primary study area. The above total trips results in an additional 3-4 daily trips over a 530-day construction period. This is deemed negligible and would not have an impact on regional routes during a scenario of concurrent construction.

In conclusion, the cumulative impact and significance of the various nearby renewable energy projects is considered to have a low/ negligible impact and therefore no corrective measures will be required.

7.6 IMPACT ASSESSMENT

Following the definitions of the term, the "residual effects on the environment", i.e. effects after mitigation measures have been put in place, combined with the environmental effects of past, present and future projects and activities will be considered in this assessment. Also, a "combination of different individual environmental effects of the project acting on the same environmental component" can result in cumulative effects.

7.6.1 Potential Cumulative Effects

The receptors (hereafter referred to as Valued Ecosystem Components (VECs) presented in Section 6 (refer to the matrix analysis) have been examined alongside other past, present and future projects

for potential adverse cumulative effects. A summary of the cumulative effects discussed are summarized in Table 7.2. Specific VECs have been identified with reference to the Castor Solar PV Project (Table 6.2), which relates to the biophysical and socio-economic environments. Table 7.2 indicates the potential cumulative effects VECs and the rationale for inclusion/exclusion.

Table 7.2: Potential Cumulative Effects for the proposed project

	Valued Ecosystem Components (VECs)	Rationale for Inclusion / Exclusion	Level of Cumulative Effect
Construction Phase			
Terrestrial Ecology Impact Assessment	Loss of habitat, and disruption of surrounding ecological corridors.	Clearing of vegetation for construction of infrastructure, access roads etc. will be undertaken. A loss of habitat and disruption to ecological corridors is expected, albeit limited.	- Medium
Avifaunal Impact Assessment	Loss of habitat, and degradation of surrounding ecological corridors.	Clearing of vegetation for construction of infrastructure, access roads etc. will be undertaken. A loss of habitat and disruption to ecological corridors is expected, albeit limited. This may lead to the disruption and displacement of avian species present within the area.	- Medium
Agricultural Compliance Statement	Loss of agricultural land and impact on soils	The cumulative impact of loss of agricultural land use will not have an unacceptable negative impact on the agricultural production capability of the area. The proposed development is therefore acceptable in terms of cumulative impact.	- Low (negligible)
Heritage Impact Assessment	Direct or physical impacts, implying alteration or destruction of heritage features within the project boundaries and indirect impacts, e.g. restriction of access or visual intrusion concerning the broader environment.	The cultural heritage profile of the larger region is very low. Most frequently found are farmsteads, formal and informal burial sites. Heritage resources are sparsely distributed on the wider landscape with highly significant (Grade 1) sites being rare.	- Low (negligible)
Social Impact	Impacts of employment opportunities, business opportunities and skills development	The Castor Solar PV Project and the establishment of other solar power projects within the area has the potential to result in significant positive cumulative impacts, specifically with regards to the creation of a number of socio-economic opportunities for the	+ Medium

Assessment		region, which in turn, can result in positive social benefits. The positive cumulative impacts include creation of employment, skills development and training opportunities, and downstream business opportunities. The cumulative benefits to the local, regional, and national economy through employment and procurement of services are more considerable than that of Castor Solar PV Project alone.	
	Impact of large-scale in-migration of people	While the development of a single solar power project may not result in a major influx of people into an area, the development of several projects may have a cumulative impact on the in-migration and movement of people. In addition, the fact that the project is proposed within an area characterised by good levels of solar irradiation suitable for the development of commercial solar energy facilities implies that the surrounding area is likely to be subject to considerable future applications for PV energy facilities.	- Medium
Traffic Impact Study	Increased traffic on regional haulage routes	The haulage routes for heavy vehicles for the shipment of solar panels and major components include regional routes that would be impacted by the simultaneous construction of similar projects within 30 km of the development. This cumulative scenario is expected to slightly increase the average daily traffic of the routes used over the construction period.	- Low
Operational Phase			
Terrestrial Ecology Impact Assessment	Loss of habitat, and disruption of surrounding ecological corridors.	Clearing of vegetation for construction of infrastructure, access roads etc. will be undertaken. A loss of habitat and disruption to ecological corridors is expected, albeit limited.	- Medium
Avifaunal Impact Assessment	Loss of habitat, and degradation of surrounding ecological corridors.	Clearing of vegetation for construction of infrastructure, access roads etc. will be undertaken. A loss of habitat and disruption to ecological corridors is expected, albeit limited.	- Medium

		This may lead to the disruption and displacement of avian species present within the area.	
Visual Impact Assessment	Visual impacts related to the Castor Solar PV Project and power line	The anticipated cumulative visual impact of the proposed Castor Solar PV Project is expected to include the change in sense of place, as well as the precedent being set for solar energy facility development in the area where currently there is only a precedent for agricultural related activities. Further construction and operation of the solar energy facilities in the area is likely to have a negative impact.	- Medium
Heritage Impact Assessment	Direct or physical impacts, implying alteration or destruction of heritage features within the project boundaries and indirect impacts, e.g. restriction of access or visual intrusion concerning the broader environment.	The cultural heritage profile of the larger region is very low. Most frequently found are farmsteads, formal and informal burial sites. Heritage resources are sparsely distributed on the wider landscape with highly significant (Grade 1) sites being rare.	- Low (negligible)
Decommissioning Phase			
Terrestrial Ecology Impact Assessment	Loss of habitat, and disruption of surrounding ecological corridors.	Clearing of vegetation for construction of infrastructure, access roads etc. will be undertaken. A loss of habitat and disruption to ecological corridors is expected, albeit limited.	- Medium
Visual Impact Assessment	Visual Intrusion	The decommissioning of the facility and power line may increase the cumulative visual impact together with farming activities and people using the existing gravel roads adjacent to site increasing the amount of dust generated. Dust control and housekeeping will be the main factors to consider.	- Low
Other	Generation of waste	An additional demand on municipal services could result in significant cumulative impacts with regards to the availability of landfill space.	- Medium

7.7 CONCLUSION

This chapter of the Basic Assessment Report addressed the cumulative environmental effects of the construction, operation and decommissioning project phases. The information to date has shown that no significant adverse residual impacts are likely. However, cumulative impacts could arise as other similar projects are constructed in the area. All cumulative impacts will be of a medium or low significance.

The potential most significant cumulative impacts (of a medium significance) relate to:

- Cumulative effects during construction phase:
  - Loss of habitat and disruption of surrounding ecological corridors (- Medium)
  - Impacts of employment opportunities, business opportunities and skills development (+ Medium)
  - Impact with large-scale in-migration of people (- Medium)
- Cumulative effects during the operational phase:
  - Loss of habitat and disruption of surrounding ecological corridors (- Medium)
  - Visual impacts related to the solar energy facility and power line (- Medium)
- Cumulative effects during the decommissioning phase:
  - Loss of habitat and disruption of surrounding ecological corridors (- Medium)
  - Generation of waste (- Medium)

The cumulative impact for the proposed development is medium to low and no high, unacceptable impacts related to the project is expected. Considering the extent of the project and information presented in section 7 of this report, it can be concluded that the cumulative impacts will not result in large scale changes and impacts on the environment. This is also based on the fact that only two other solar energy facilities are located within the geographic area of investigation and the vegetation associated with the area considered as Least Threatened, as well as the limited development footprint (~40ha) associated with the Castor Solar PV Project.

Photovoltaic solar energy technology is a clean technology which contributes toward a better-quality environment. The proposed project will contribute to local economic growth by supporting industry development in line with provincial and regional goals and ensuring advanced skills are drawn to the Free State Province. No cumulative impacts with a high residual risk have been identified.

In terms of the desirability of the development of renewable energy, it may be preferable to incur a higher cumulative loss in such a region as this one (outside of any areas of conservation or highly productive agricultural land), than to lose land with a higher environmental value elsewhere in the country. Also, the acceptable cumulative impacts expected will not result in a whole-scale change of the environment and therefore are considered to be acceptable, and considering the associated positive impacts associated with the development of solar energy facilities, the proposed facility is considered desirable.

8 ENVIRONMENTAL IMPACT STATEMENT

This section aims to address the following requirements of the regulations:

Appendix 3. (3) An BAR (...) must include-

(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 site 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;

(m) based on the assessment, and where applicable, impact management measures from specialist reports, the recording of proposed impact management objectives, and the impact management outcomes for the development for inclusion in the EMPr;

(n) 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;

(o) a description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed;

(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;

8.1 SUMMARY OF KEY FINDINGS AND ASSESSMENT RESULTS

Based on the contents of the report the following key environmental issues were identified, which were assessed and addressed in this draft BA report. The ratings provided gives an indication of the impact significance with the implementation of the recommended mitigation measures. It must be noted that only impacts with a significance rating higher than low is indicated below as these are the impacts requiring more intense mitigation.

- Impacts during construction phase:
  - Impacts to fauna (- Medium)
  - Dust impacts (- Medium)
  - Waste management (- Medium)
  - Avifauna habitat destruction within the development footprint (- Medium)
- Impacts during the operational phase:
  - Collisions of avifauna with infrastructure associated with the facility (- Medium)

- Direct and Indirect employment opportunities and skills development (+ Medium)
- Development of non-polluting, renewable energy infrastructure (+ Medium)
- Contribution to Local Economic Development (LED) and social upliftment (+ Medium)

➢ The cumulative impact for the proposed development is medium to low and no high, unacceptable impacts related to the project is expected. The cumulative impacts will not result in large scale changes and impacts on the environment.

8.2 SENSITIVITY ANALYSIS SUMMARY AND SITE-SPECIFIC CONDITIONS

The sensitivity analysis has guided the developer in optimising the final layout of the Castor Solar PV Project through identifying specific environmental areas and features present within the site which needs to be avoided through the careful placement of infrastructure as part of the development footprint. Refer to Section 6.4 for the complete sensitivity analysis and Appendix G for the final layout map which avoids the areas required to be conserved.

Only one area has been identified as no-go for development within the entire site. The Rocky Thornveld is of a high ecological sensitivity and therefore needs to be avoided by development. The habitat is located within the south eastern corner of the site, near the Bosplaat Rural Substation. This area has been considered by the Applicant and is not being considered for the placement of any infrastructure.

Further mitigation measures for the development, as recommended by the independent specialists, have been included in the EMPr(s) for the project as per Appendix E1-E4.

8.3 TECHNICAL DETAILS OF THE PROPOSED INFRASTRUCTURE TO BE AUTHORISED

- PV Panel Array - To produce up to 20MW, the proposed facilities will require numerous linked cells placed behind a protective glass sheet to form a panel. Multiple panels will be required to form the solar PV arrays which will comprise the PV facility. The PV panels will be mounted to a single access tracking frame system.
- Wiring to String or Central Inverters - Sections of the PV array will be wired to either string or central inverters. The inverter is a pulse width mode inverter that converts direct current (DC) electricity to alternating current (AC) electricity at grid frequency.
- Connection to the grid - - Connecting the PV plant to the electrical grid requires transformation of voltage to 22kV or 66kV. The normal components and dimensions of a distribution rated electrical substation will be required. An onsite substation and switching stations will be required on the site to step the voltage up to 22kV or 66kV, after which the power will be evacuated into the national grid via a new proposed power line. It is expected that generation from the facility will tie in with the existing Bosplaat Rural Substation located within the affected property. The power line routes (four options for the alignment) will be placed within a grid connection corridor of between 50 and 200m wide, which will connect the project to the existing Eskom substation compound. All route options fall within the grid connection corridor proposed and assessed and all are considered to be technically

feasible and environmentally appropriate, and therefore approval of the entire grid connection corridor is requested rather than one of the route options within the corridor. This will provide flexibility for the development from a technical perspective.

- Electrical reticulation network – An internal electrical reticulation network will be required and will be lain ~2-4 m underground as far as practically possible.
- Supporting Infrastructure – The following auxiliary buildings with basic services including water and electricity will be required on site:
    - Roads: 6600m^2
    - Access gate: 10m
    - O&M Building: 400m^2
    - Laydown Area: 2000m^2
- Roads – Access will be obtained via the R64 regional road to the south of the site. An internal site road network will also be required to provide access to the solar field and associated infrastructure.
- Fencing - For health, safety and security reasons, the facility will be required to be fenced off from the surrounding farm. Fencing with a height of up to 3 meters will be used.

8.4 RECOMMENDATION OF EAP

The final recommendation by the EAP considered firstly if the legal requirements for the EIA process had been met and secondly the validity and reliability of the substance of the information contained in the BA report. In terms of the legal requirements it is concluded that:

- All key consultees have been consulted as required by Chapter 6 of the EIA Regulations (as amended).
- The Basic Assessment process has been conducted as required by the EIA Regulations (as amended), Regulations 19 and Appendix 1.
- The EMPr was compiled in conjunction with the Generic EMPr for overhead electricity transmission and distribution infrastructure as per Government Notice 435, which was published in Government Gazette 42323 on 22 March 2019.
- The EMPr was compiled in conjunction with the Generic EMPr for the development of the associated substation infrastructure for transmission and distribution of electricity as per Government Notice 435, which was published in Government Gazette 42323 on 22 March 2019.
- The EMPr was compiled for the Castor Solar PV Project as per Appendix 4 of the EIA Regulations (GN.R. 326), published in Government Gazette 40772 on 07 April 2017.
- The proposed mitigation measures will be sufficient to mitigate the identified impacts to an acceptable level, no impacts of a high significance are relevant, with minimal impacts of a

medium significance expected, following the implementation of the recommended mitigation measures.

- The layout of the Castor Solar PV Project is in line with the requirements and recommendations of the independent specialists and environmental sensitivities and therefore it is recommended that the layout be approved.

In terms of the contents and substance of the BA report the EAP is confident that all key environmental issues were identified, assessed and mitigation measures recommended for. These key issues have been adequately assessed during the BA process to provide the competent authority with sufficient information to allow them to make an informed decision.

The final recommendation of the EAP is that:

It is the opinion of the independent EAP that the proposed development will have a net positive impact for the area and will subsequently ensure the optimal utilisation of resources and land. All negative environmental impacts can further be effectively mitigated through the proposed mitigation measures. Based on the contents of the report it is proposed that an environmental authorisation be issued, which states (amongst other general conditions) that the Castor Solar PV Project and associated infrastructure on Portion 1 of the Farm Merriesfontein No. 1725, Registration Division Boshof, Free State Province be approved subject to the following conditions:

- Implementation of the proposed mitigation measures set out in the EMPr(s).
- Implementation of the proposed mitigation measures set out in the specialist studies.
- The Castor Solar PV Project must comply with all relevant national environmental laws and regulations.
- All actions and tasks allocated in the EMPr(s) should not be neglected and a copy of the EMPr(s) should be made available onsite at all times.
- A detailed Geotechnical Assessment must be undertaken for the development footprint, with specific focus on areas with dolomite grassland, as part of the micro-siting of the layout.
- Should archaeological sites or graves be exposed during construction work, it must immediately be reported to a heritage practitioner so that an investigation and evaluation of the finds can be made.
- A wet season vegetation walkthrough of the site must be conducted prior to the commencement of the project construction phase.

We trust that the department finds the report in order and eagerly await your comment and input in this regard.

Lisa de Lange (Opperman)

Environamics - Environmental Consultants

9 REFERENCES

.

ACTS see SOUTH AFRICA.

ANON. nd. Guidelines for Environmental Impact Assessments. http://redlist.sanbi.org/eiaguidelines.php

BODEN, T.A., G. MARLAND, and R.J. ANDRES. 2011. Global, Regional, and National Fossil-Fuel CO2 Emissions. Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, U.S. Department of Energy, Oak Ridge, Tenn., U.S.A.

BVI CONSULTING ENGINEERS WESTERN CAPE (2022). Traffic Impact Assessment for the Transportation of Solar Energy Equipment to the Castor Solar PV Project near Boshoff, Free State Province.

CONSTITUTION *see* SOUTH AFRICA. 1996.

DEPARTMENT OF ENERGY (DoE). Integrated Resource Plan 2010-2030

DEPARTMENT OF MINERALS AND ENERGY (DME). 2003. White Paper on Renewable Energy.

DONAWAY ENVIRONMENTAL (2022). Social Impact Assessment: The Proposed Castor Solar Power Plant near Boshof, Free State Province.

DONAWAY ENVIRONMENTAL (2022). Visual Impact Assessment: The Proposed Castor Solar Power Plant near Boshof, Free State Province.

ENERGY BLOG. 2015. Energy Blog – Project Database. [Web:] http://www.energy.org.za/knowledge-tools/project-database?search=project lookup&task=search [Date of assess: 28 September 2015].

FIRST SOLAR. 2011. PV Technology comparison.

FREE STATE DEPARTMENT OF ECONOMIC DEVELOPMENT, TOURISM AND ENVIRONMENTAL AFFAIRS :Free State Provincial Spatial Development Framework (PSDF) (2012)

J A VAN SCHALKWYK (2022). Phase 1 Cultural Heritage Impact Assessment: The Development of the Castor Solar PV Project, Tokologo Local Municipality,Free State Province

LEJWELEPUTSWA DISTRICT MUNICIPALITY: Lejweleputswa District Municipality Final Integrated Development Plan (IDP) 2021 – 2022 (2021)

MUCINA, L. AND RUTHERFORD, M.C. 2006. The vegetation of South Africa, Lesotho and Swaziland. *Strelitzia* 19. South African National Biodiversity Institute, Pretoria.

NATIONAL DEPARTMENT OF AGRICULTURE. 2006. Development and Application of a Land Capability Classification System for South Africa.

NATURA VIVA CC (2013). RECOMMENDED EXEMPTION FROM FURTHER PALAEONTOLOGICAL STUDIES: Proposed Boshof - Les Marais / Buitenfontein Solar Energy Facility, Farm Les Marais 137 near Boshof, Free State Province.

NERSA. 2009. South Africa Renewable Energy Feed-in Tariff (REFIT) – Regulatory Guidelines.

SANBI. 2016. Guidelines for Environmental Impact Assessments. [Web:] http://redlist.sanbi.org/eiaguidelines.php. Date of access: 26 April 2016.

SOLARGIS. 2021. Global Horizontal Irradiation (GHI). [Web:] https://globalsolaratlas. info/ download/south-africa [Date of access: 04 May 2021].

SOUTH AFRICA(a). 1998. The Conservation of Agricultural Resources Act, No. 85 of 1983. Pretoria: Government Printer.

SOUTH AFRICA(a). 1998. The National Environmental Management Act, No. 107 of 1998. Pretoria: Government Printer.

SOUTH AFRICA(a). 2008. The National Energy Act, No. 34 of 2008. Pretoria: Government Printer.

SOUTH AFRICA(b). 1998. The National Water Act, No. 36 of 1998. Pretoria: Government Printer.

SOUTH AFRICA(b). 2008. The National Environmental Management: Waste Act, No. 59 of 2008. Pretoria: Government Printer.

SOUTH AFRICA. 1996. Constitution of the Republic of South Africa as adopted by the Constitutional Assembly on 8 May 1996 and as amended on 11 October 1996. (B34B-96.) (ISBN: 0-260-20716-7.)

SOUTH AFRICA. 1999. The National Heritage Resources Act, No. 25 of 1999. Pretoria: Government Printer.

SOUTH AFRICA. 2004. The National Environment Management: Air Quality Act, No. 39 of 2004. Pretoria: Government Printer.

SOUTH AFRICA. 2010. Regulations in terms of Chapter 5 of the National Environmental Management Act, 1998. (GNR. 543, 544 and 545. 2010.). Pretoria: Government Printer.

SOUTH AFRICA. Minister in the Presidence: Planning. 2009. *Medium Term Strategic Framework. – A Framework to guide Governments Programme in the Electoral Mandate Period 2009-2014*.

SWINGLER, S. 2006. Statistics on Underground Cable in Transmission networks, Final Report of CIGRE Working Group B1.07.

THE BIODIVERSITY COMPANY (2022). Avifauna Impact Assessment for the proposed Castor Solar PV Project.

THE BIODIVERSITY COMPANY (2022). Soil And Agricultural Assessment for the proposed Castor Solar PV Project.

THE BIODIVERSITY COMPANY (2022). Terrestrial Ecology Baseline & Impact Assessment for the proposed Castor Solar PV Project.

THE BIODIVERSITY COMPANY (2022). Wetland Baseline & Risk Assessment for the proposed Castor Solar PV Project.

THE MESOTHELIOMA CENTRE. 2016. Mesothelioma in South Africa. [Web:] http://www.asbestos.com/mesothelioma/south-africa/. [Date of access: 27 June 2016].

TOKOLOGO LOCAL MUNICIPALITY: Tokologo Local Municipality Final Integrated Development Plan 2020/2021 (2021)

WORLD BANK GROUP. 2006. The Equator Principles.